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EDITORIALS

THE FOG RISES—A present trend, for which, I believe, the Society for American Archaeology is responsible to an appreciable extent, is toward a sane analysis of the supposed, almost traditional differences in interests between professional and amateur students of archaeology. Old and new recriminations, often bitter and highly colored with emotionalism, are being scrutinized, coldly and without prejudice, to determine their basic truth or falsity.

As a result of this timely investigation, it becomes increasingly apparent that the underlying cause for the unfortunate conflict has been misunderstanding. The amateur has pictured the professional as an egotistic know-it-all, seated high upon a self-erected pedestal of false superiority, unapproachable, speaking an unintelligible language, and condemning all collectors as intellectual inferiors while disdaining to lend a hand toward improving their debased condition. The professional has visualized the average amateur collector as an incurable vandal, engaging blindly in the wholesale, wanton destruction of invaluable information in order to add a few new "relics" to his collection, wholly ignorant of the cultural and historical significance of such specimens—and with no desire to learn, establishing unreasonably high monetary values for archaeological materials—and thereby fostering and supporting the vandalistic practices of unscrupulous dealers, and often failing even to keep a catalogue or other accurate record of the origin of collected materials.

Unfortunately, individuals on both sides of the fence have served as excellent examples to justify these opinions, and the innocent majority has shared a reputation earned by the guilty few; but even the guilty are more the victims of circumstances than wilful agents of malicious intent. For both sides it may be said that a lack of information is to be condemned only in proportion to the ready availability of that information. No adequate effort has ever been made by professionals to render accessible to non-professional students the purposes, methods and ethics of the science of archaeology. Nor has the collector-student

engaged in a very convincing program to sell himself as a potential helper in pure archaeological pursuits. Thus each has erred as a result of the other's error.

Gradually, professionals and amateurs are becoming better acquainted with each other. The fog of mutual suspicion is rising. Each is beginning to see in the other a fellow student who has capabilities for serving toward supplying his own needs. This is as it should be, and it is to be hoped that all who are seriously interested in American archaeology, whether as technical specialists, local collectors of materials and data, or general-interest students, do their utmost toward improving the feeling of common interest and mutual assistance which should, and eventually will prevail in the American field.

Many in the professional group are coming to realize the importance of making available clear, simple statements on archaeological technique and terminology, in answer to a growing, insistent demand by non-professionals. AMERICAN ANTIQUITY hopes soon to contribute to this program through the medium of the Note-book series. This will appear as occasional short expositions on methodology, released in the form of mimeographed loose leaves to be incorporated in a note-book, if the recipient so desires.

It is anticipated that material for the Note-book will be contributed by both professionals and amateurs, in accordance with their respective problems and angles of approach. In this way various ideas on method could be critically compared, and a profitable discussion of technical procedures, some of which have never been standardized by professionals, be encouraged.

Having entertained the idea for years, and adopted certain initial plans, we propose to release a first issue of the Note-book within the near future. We invite you to let us know your reaction to such an addition to our program. Its fulfillment may depend largely upon your endorsement, and its exact nature will certainly be influenced by your expressed desires.

W. C. M.

SOME METHODS USED IN EXCAVATING EASTERN SHELL HEAPS

DOUGLAS S. BYERS[167] AND FREDERICK JOHNSON[168]

INTRODUCTION

THIS PAPER is intended as an aid for those conscientious amateur archaeologists who are interested in preserving their specimens and the data which goes with them. In answer to many questions, and in the hope that this paper may be of some help to those desiring to systematize their field methods, there are here set down some of the practices that have been applied to shell heap excavation with fair success.

In excavating a site, it is entirely destroyed. It is important that the record of the work be as complete as possible in order that the material may be put together in its original relationship. The excavator should obtain a clear and comprehensive idea of the growth of the shell heap and the character of the material found in it. This, when organized according to some plan, should be published, for then the facts which have been gleaned are placed before people who are interested in them. Good reports from systematic records are things to be proud of and are appreciated by a wide variety of individuals. People who are honestly interested in careful excavation, but have no means of publishing their findings, should not leave their records in the form of "raw" field notes. Such notes, no matter how carefully taken, can only be fully interpreted by their author. Furthermore, field notes grow "cold" after a few years, or even after a second site has been worked, and they cease to be fully understandable. It is, therefore, of the utmost importance to convert field notes into a comprehensible report. The completion of the report is really as much of an obligation as recording the excavation. When undertaking any excavation, the report should always be kept in mind, and the taking of notes should be guided by the plans for the finished work. As a matter of fact, it is as much fun to complete a report as it is to excavate a site, and when it is finished there is the complete satisfaction of having a job well done. Never forget that you will have something factual and definite which will explain and add to the collection of artifacts of which you are so justly proud.

There is nothing new or unusual about the methods which are de-

[167] Director, Department of Archaeology, Phillips Academy, Andover, Massachusetts.

[168] Curator, Department of Archaeology, Phillips Academy, Andover, Massachusetts.

scribed below. They are presented solely for their value as a routine of method which brings out remarkably well a number of the extremely important peculiarities of shell heaps, peculiarities which have not been suspected before. Not one of the various procedures that simplify the task of recording the excavation is by any means new to archaeology. In fact, some of the "methods" are such common knowledge that it seems almost unnecessary to mention them. In spite of the fact that these steps are well known, they are included here in an attempt to describe a routine of recording from beginning to end.

Although certain steps to be taken, and ways of taking them are described, the important thing is the development of a routine for recording data. Through such a routine the facts are recorded in a certain regular order so that the relationship between one set of facts and that which precedes or follows is always clear. One can always complain that so many unexpected things appear that it is impossible to adhere to a system. We have found that in the end there are few deviations from the fundamentals of a carefully arranged routine, and that when there is a necessary deviation a careful description of the newly adopted process of recording makes it possible to work it into the general scheme. The necessity and value of keeping to a system becomes clearly apparent when one begins to reduce the field notes to their final form.

EQUIPMENT

The subject of equipment could easily consume several volumes. Here we mention the tools which appear to be essential. There are many more things which are handy and occasionally necessary to have, as evidenced by our own equipment list covering six typewritten pages.

For the actual excavation you need a five- to six-inch pointing trowel, jackknife or scalpel, axe, shovel, possibly a grub hoe for sodding, a two-inch paint brush, a half-inch brush for fine work, and a whisk broom. For recording data you need pencils, a note board equipped with ruled five-by-eight note cards or else a notebook, probably a loose leaf one. If you use the cards you should have a file box in which to keep them. You also need an accurate tape and rule, chalk line, possibly a straight edge, carpenter's level, plumb bob, bags or small boxes for specimens, tags or strips of paper for numbers, and a reliable camera.[169]

[169] The subject of cameras is something to provoke the most heated discussions between supporters of the various makes. It is not necessary to have anything more elaborate than a box camera, such as a Brownie, provided you know how to use it. A film-pack camera with a ground-glass for focusing is extremely useful in taking close-ups of archaeological features. In any case, however, if you know the limitations of your camera

If you can add to this equipment, we would suggest, for reasons to be explained, colored pencils, graph paper, drawing board, thumb tacks, and an accurate rule graduated to correspond to the lines on the graph paper. As sticks are apt to fall over or get broken, a supply of stakes should be taken to each site.

A DEFINITION OF SHELL HEAPS

In general, shell heaps are piles of refuse, consisting principally of shells, that accumulate where groups of people have lived. Besides shells, the heaps contain animal bones, pottery, artifacts, and other evidences of human occupation.

In reality these heaps are a particular type of refuse dump, with characteristics that appear to be peculiar to their several methods of growth. Beneath the layers of shells there may be a layer of soil stained dark through years of occupation, and built up, in large part, by the occupation of the site before shells were piled in that particular spot. This does not mean that the entire foundation of the shell heap was occupied simultaneously before the growth of the heap began. The occupation was more likely peripheral, the area receding as the accumulated shells piled up. Probably people performed their homely domestic duties on the ground at the edge of the heap, moving back as the spreading of the shells enlarged the dump. Living floors and hearths are found not only below the shells but also among them. Graves may be encountered quite unexpectedly. Pottery, whole or broken; implements, frequently broken, of stone and bone; and the remains of food animals are found in association with the living surfaces.

The occurrence of living surfaces among the shells may be due to a sequence of occupations, but is more probably due to the shifting of the living areas onto spots already covered with shells. Frequently these intercalated layers will be found to tie in with the occupational debris underlying the entire heap.

Shell heaps may be differentiated into layers composed of a variety of constituent elements occurring in different proportions. In some layers clams will predominate, while in others quahogs or oysters may be the most common shells; sometimes the shells will be found to be broken by trampling, while in other layers they will be practically unbroken. In some heaps there are indications that there are hearths, either as contemporary deposits or as earlier or later deposits connected

and can use it to the best advantage you will make out very well with any type, no matter what it costs.

with these layers. The story of the growth and general relationship of these layers becomes the story of the site, since the differences in their composition are due to the habits of the occupants. The problem of recording these phenomena resolves itself into a description of the character of each level (including, of course, the artifacts found in it) and the delimitation of the level both horizontally and vertically.

We have reason to believe that a shell heap may be built in either, or both, of at least two ways. One is by successive dumping of quantities of shells in several nearby places. This type of dumping produces scattered but interlocking mounds. The mounds can often be related to one another so that a sequence from earlier to later can be determined. This seems to be characteristic of heaps that have accumulated on flat areas. The second manner of growth is by the scattering of shells fairly evenly from the edge of a bank or the brow of a mound. The result of this method of dumping is a series of irregular, often overlapping, and usually tilted layers. Careful recording usually brings out clearly the sequence of deposition. In these heaps the layers are by no means uniform in size or thickness, nor are they level throughout their extent. Dips in the surface and in the bottom may indicate changes in the direction of dumping or differences in relationship between layers.

THE MAP

It seems to us that a map of a shell heap is an extremely important and valuable document because it is the one control for all the measurements which are taken. The map should describe, first of all, the immediate terrain. Such features as ledges, slopes, springs, and beaches should be clearly delimited. Any features which have changed the appearance of the shell heap since it was deposited, such as paths, fences, recent trees, washing away of banks, or other modifications should also be drawn in. Contours with small enough difference in elevation should be used to show the hollows and mounds on the surface, particularly those which are caused by the irregularities of the upper surface of the shell heap.

One of the most important functions of a map is to show the location and relationship of the various stakes and sections which are used during the excavation. Theoretically it makes no difference where one puts stakes from which to measure, but in actual practice it is much more convenient, if not necessary, to set stakes according to some definite system. We prefer to set up a base line running from one side of the site to the other. This line does not need to run north and south or east

Negative No. 27 Museum No.
Subject
East wall on 1E line between 1C and 1B.3, showing lower shell stratum

Situation Section 1C/1E

Site Nevin Shell Heap Site No. Me. 152/1

Location Blue Hill Falls, Maine.

Light Time APM
Exposure Film

DEPT. OF ARCHAEOLOGY
FIELD NEGATIVE FILE

a

Field No. 2365 Museum No.
Specimen
Bone Awl

Situation Grave 5; #216B; butt under butt of #216A; shank beside shank of 216A.

Site Nevin Shell Heap Site No. Me. 152/1

Location
Blue Hill Falls, Me.

Remarks
F. J. Notes; 8/11/37
This fits #2375

DEPT. OF ARCHAEOLOGY
FIELD CATALOGUE

5000-7-36

b

FIG. 19.—(a) Example of Field Specimen card; (b) example of Photograph Card.

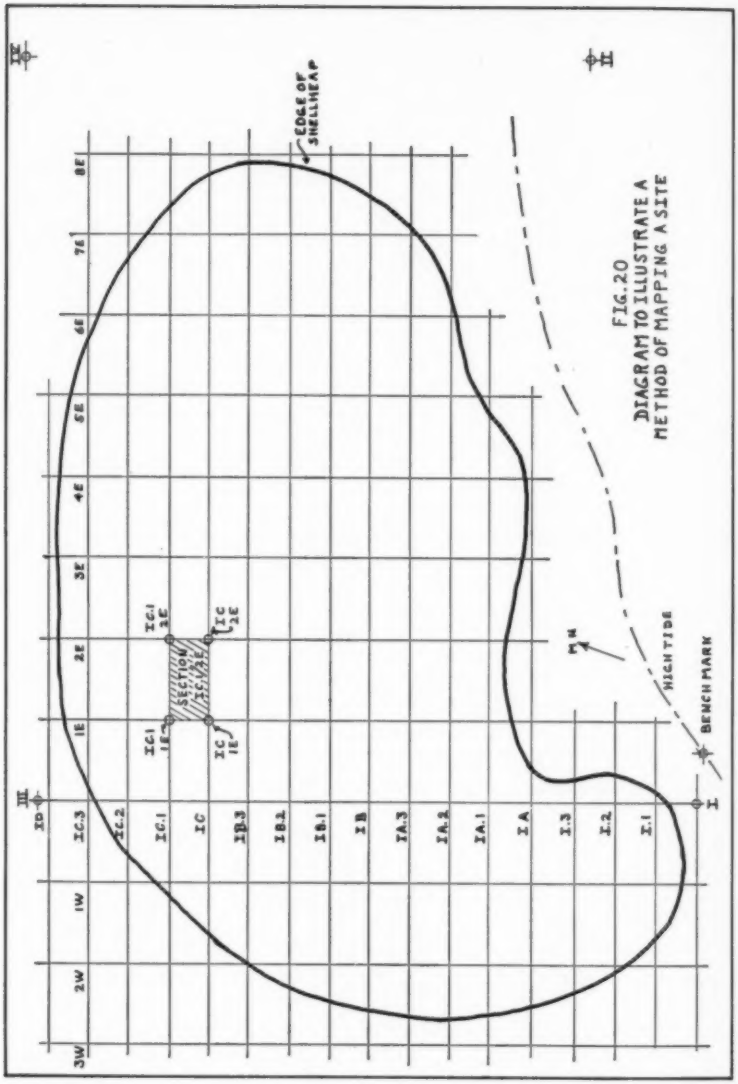


FIG. 20
DIAGRAM TO ILLUSTRATE A METHOD OF MAPPING A SITE

and west. Ours have not always done so, but for convenience we have called the base and section lines the north-south lines, and the trench lines the east-west lines, and have laid them to correspond as nearly as feasible to these directions. Much time and trouble can be saved by locating the base line so that as large an area as possible may be controlled from it. On many shell heaps a single base line will not be of service for the whole area to be studied. We have found that by imposing a large rectangle, i.e., four stakes, or a series of rectangles upon a site, the survey will not get away from you (Figure 20, stakes I, II, III, IV). There will always be at least two carefully located base points from which you can establish section stakes or any other necessary point. We should add that when using more than two base points they will lie a considerable distance apart, outside the area to be excavated. Because of the distance, they are difficult to locate accurately without the aid of some surveying instrument.[170] A common army marching compass can be used with some success, but if this piece of equipment is not available we would suggest that the single base line be laid out with a 300-foot chalk line. As a matter of fact a 100-foot base line will handle all that one, two, or perhaps three men can possibly excavate in a New England summer.

The base line is set up by driving two stakes outside the area which is to be excavated. The line between these stakes is marked off in equal parts, say one meter, two meters, one yard, or two yards. Lines are then run at right angles to the base line and stakes set at regular distances either equal to or double the distance between the stakes on the base line. We have found it extremely convenient to have the stakes on the base line (north and south) set at one-meter intervals, and the section stakes (east and west) set at two-meter intervals (Figure 20). This gives the troweller a section one meter by two meters, an area which is convenient to work in. The whole section can be reached without walking on it, and any spot can be located from the stakes with a two-meter tape.

A simple method of designating the sections involves the use of two coördinates. The method which we have used involves laying the base line out in four-meter units (Figure 20). The south end of the line is designated I, and the four-meter stakes are marked IA, IB, IC, and ID. Stakes are set between these at intervals of one meter, so that the base

[170] Instructions for making a plane table and alidade which would be suitable for this type of surveying may be found in many publications devoted to home shop work. Directions for using this equipment may be found in any surveyor's manual.

line is, in effect, laid off in one-meter units. These stakes are marked I, I.1, I.2, I.3, IA, IA.1, IA.2, and so forth up to the end of the line, which in this case is ID. On either side of the base line two-meter sections are laid out and the stakes to the east are marked 1E, 2E, 3E, and so on, those to the west, 1W, 2W, 3W and so forth, as far as the limits of the heap require. All the stakes bear the designation of the base-line stake and the section stake. Thus, the stakes in the IA.3 line are marked IA.3/1E, IA.3/2E, IA.3/1W, and so forth, the stakes in the IB line are marked IB/1E, IB/1W, as the case might be. The sections are designated by the number of the stake farthest from the I stake on the base line, either the northeast corner stake or the northwest corner stake. Thus, Section IC.1/2E is bounded on the south by the IC line between IC/1E and IC/2E, on the north by the IC.1 line between IC.1/1E and IC.1/2E, on the east by the 2E line between IC.1/2E and IC/2E, and on the west by the 1E line between IC.1/1E and IC/1E (Figure 20). In this way a section is located beyond any possible confusion.

The advantage of this system of numbering is that it is elastic and can be expanded in any direction. If it is necessary to work south of point I, the extension of the base line can be laid out as S numbers in place of the I numbers of the original base line. While it is possible to duplicate and otherwise confuse the order of sections when they are simply designated by a running number, it is obviously impossible to duplicate with such a system as we have described. It is not our invention. Similar systems are used in township surveys, and in every job where rectangles are the desired end product.

We are the proud possessors of a plane table and have used this instrument to great advantage in rapidly and accurately locating and setting the stakes. This is not necessary, however, for it can be done with a chalk line and a measuring tape; two tapes are even better. The chalk line should be stretched tightly between the two ends of the base line, and the stakes driven beneath it.[171] A flat-headed roofing tack should be driven into the top of each stake to mark the exact spot that is represented on the map, and all measurements should be made from this tack.

Lines at right angles to the base line can be constructed by use of a "3-4-5 triangle." For example, in setting up the IB line (Figure 20)

[171] Experience has shown that stakes should be sturdy, say 2×2 inches, and in the neighborhood of 3 feet long. At least 18 inches to 2 feet of the stake must be driven firmly into the ground to prevent its moving.

measure out from stake IB four meters. From IB.3, which is three meters from IB, measure out five meters. Swing the five-meter measurement to meet the four-meter measurement and drive a stake beneath the intersection. This intersection will be the location of stake IB/2E. The triangle just constructed has the right angle at IB. A chalk line stretched from IB over IB/2E will be at right angles to the base line and section stakes can be laid out on it by setting them two meters apart, beginning at IB.

Levels should be controlled from some artificial but permanent spot below the deposit, or ideally, from tide level. While it is next to impossible to draw contours without a surveying instrument, the levels of the stakes in reference to some bench mark should be determined. Approximate contours may be drawn in, but it should be noted that they are not accurate. Levels can be determined with the aid of a carpenter's level and a chalk line, or a reasonably accurate straight edge with parallel sides. The straight edge must be long enough to reach between two stakes.

Before starting to determine the level of the lowest stake, it is well to decide what surface is to be used: the surface of the turf, or the surface left after the turf has been removed. Having selected the surface, make a mark on the stake at that point and stretch the line, or place one end of the straight edge at that mark. Next hold the straight edge or the line level over the bench mark and measure down to the bench mark. The measurement will represent the height of the stake above the bench mark. To determine the height of any other stake above that stake, proceed in the same way, always entering your measurements in a column on a special page in the notes headed "Levels." Be sure to make a mark on each stake to represent the point at which the level has been determined, for it is from this mark that all detailed work must be levelled. Reasonable care must be exercised in this work as errors pile up rapidly (Figure 21).

The principle reason for going into this boring detail is to attempt to show how it is possible to control the work which one is doing. After all, in destroying a site by archaeological excavation one attempts to record the work in such a way that the site can be reconstructed on paper, even to the smallest detail. During this destruction, one measures every deposit both horizontally and vertically. If these measurements are not controlled from recognizable and fixed points, one important part of the work cannot be related to another important part. When exact relationships cannot be depicted and explained, the records made

and the work done amount to little or nothing. Thus we say to investigators, and we cannot say it too forcefully, take measurements of the phenomena which interest you, but also take measurements of anything that can be measured, no matter whether it seems important or not. Be sure that your measurements are so controlled that all horizontal locations and all depths can be referred to one single point. Above all, see that your measurements are controlled by some definite system so that you can show the relationship between deposits, including artifacts, no matter how widely separated they may be.

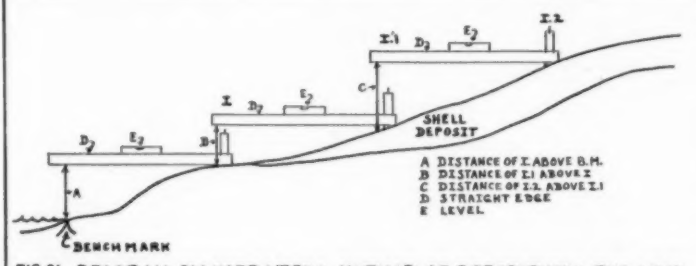


FIG.21 DIAGRAM ILLUSTRATING METHOD OF DETERMINING THE LEVEL OF THE SURFACE OF THE SHELLHEAP

NOTE TAKING

The question of what to note is extremely difficult to answer. One obvious thing should be emphasized; everything which is encountered should in some way be completely described in the notes, whether the phenomenon seems to be important or not. In the field it often seems foolish to spend a quarter or a half hour writing, but when one is ready to write the report this careful description will be of inestimable value because there will be no doubt about the necessary details. No matter how good one's memory, he cannot hold an accurate picture of many small details. Frequently it is these small details which coördinate one's ideas when the time comes for writing the report.

There is another thing to watch out for when taking notes. In excavating properly, facts are uncovered and recorded. These are the foundation upon which the work will stand. In addition, theories accounting for the various phenomena are continually coming to mind. These theories should be carefully and clearly separated from the facts.

The reason for this is that the facts are unassailable but the theories are liable to be modified, if not discarded, during the course of the work. If no distinction is made and a theory should appear as a fact, the conclusions based on it might well be false.

The type of paper which is used in taking notes is not very important. We have found that five by eight note cards used on a clip board are very satisfactory. The notes for the various sections can be filed in appropriate places. Notes can be removed, changed around, or added as the case may be. Also, sheets that get too dirty can be taken out and copied. A notebook, particularly one of the many loose leaf varieties, can be used to advantage in the same way; in fact, some people prefer this.

With the actual beginning of excavation, the note page is headed with the name of the excavator. Any particular characteristic or part of the section is entered as a subheading. The page is also numbered. Following this, the upper surface of the section is described, in detail if necessary, or if it is a surface which has just been turfed, a note is made of the fact. As one excavates, various layers will be uncovered. These should be named and described and their relationship to the layers on either side of the section should be determined. This, of course, cannot be done in any great detail if the contiguous sections have not been excavated. If the layers meet, interlock, or overlap in the section, a description of the condition together with a measured sketch of it should be included.

The recording of specimens cannot be done too carefully, for these are the notes which show the association of artifacts with the strata and with each other. *The record should be made before the specimen is removed from the ground.* In cataloguing a specimen, a blank space for the field catalogue number is left at the left-hand margin of the first line of description. At the first convenient opportunity the specimens are entered in the Field Catalogue and given a field number. The field number is then entered in the appropriate blank space in the notes. With this record it is possible to refer to the specimen by its field number.[172]

Upon the discovery of a specimen, it is described and its vertical and horizontal situation is noted. Measurements are frequently taken from the corner stakes of the section, and the level noted with respect

[172] Finally, we give the field catalogue cards and the specimens museum numbers. The field number is entered on the museum catalogue card, and so there is a complete cross reference between the specimens and the two sets of numbers.

to any one of the stakes. These measurements are not as important as the observation of the stratum in which the specimen was found. There is bound to be some error in the taking of measurements, and this error may be enough to place a specimen in the wrong stratum. For this reason it is necessary to make a note of the stratum at the same time that the measurements are taken. In many cases such observations may help to check the level of the various strata when it comes to writing the report. If there are no signs of stratification, the measurements are then supremely important, since they alone serve to place the specimens in their proper position in the deposit. This permits possible determination of various occupational periods, since differences and similarities between the upper and lower levels of a deposit can only be established when the material from the two can be separated. Upon such differentiation the validity of any theories rests.

Photographs will probably be taken to show certain details and the general progress of the excavation. A Field Photograph File similar to the Field Catalogue should be kept as an integral part of the records. Field photograph numbers should also be entered in the notes together with titles and descriptions of the pictures. These should be written down as carefully as the data regarding specimens (Figure 19, b).

The recording of graves, hearths, and other special phenomena seemingly complicates matters a little. When some deposit of this sort is found, it usually occupies more than one section. We work the section down to the top of the grave or hearth as far as possible and take the cross sections. In this case one should be certain that the cross section over the deposit is taken, even if it is necessary to take a cross section on a wall on which it would not ordinarily be done. The sections over the deposit are then removed as far as possible until the level of all sections corresponds to that of the feature being investigated. In cleaning off special deposits, we make a new heading in the notes, such as "Grave 9," or "Hearth 3," and begin the numbering of pages anew. Everything that is found during the cleaning of the deposit is then entered on these notes.

At the end of the day several varieties of notes have been accumulated. Several sections have been excavated and there are to be found a number of pages of notes from each one. There are also graves, hearths, and other special deposits recorded in the notes. It will be found convenient to file the notes according to the section. Have index tabs for 1E, 2E, 3E, and so forth, and tabs for the special deposits. In beginning the excavation of the 1E section in the IC.3 trench, number

the first page of the notes for Section IC.3/1E, page 1. From that the pages of notes for the 1E sections are numbered consecutively, the sections following one another in order from north to south. If the pages of notes from Section IC.3/1E are numbered from 1 to 13, the first page of notes for Section IC.2/1E would be numbered 14.[173] This system of numbering and filing makes it easy to remove a few pages of notes for study, and then return them to their proper place. In writing the first draft of the report, references can be made to the field notes, so that should an inconsistency appear the source of it can readily be traced down.

A word of caution should be added here. Never erase or throw away any notes that have been taken. If, for any reason, a change in the notes seems necessary, the word, sentence, or number should be written in with a different colored pencil so that the correction and the original may be seen. With corrections entered in this way no confusion can possibly occur. It is conceivable that further excavation might produce facts which make the correction unnecessary or unjustified, in which case one can refer to the original notes. It often happens that some note is not clear when it is reread. In this case, gather what data there is on the point and write it in a new page in the notes, cross-referencing it with the note to be clarified.

In every branch of note-taking it is well to stick to the principle that a card should never be thrown away. If a card is badly soiled, copy it over but keep the original and write "copied" on it, and write on the head of the duplicate card, "Copied from dirty card." Thus, you will be sure that you can trace down any possible errors from incorrect copying.

We have already had occasion to refer to the Field Catalogue. While such a catalogue is not strictly necessary when one is working alone, it is nevertheless convenient to have all the data regarding specimens in one place. Three-by-five cards kept in a file box have proven most satisfactory for our purposes. The top line is reserved for field number, on the left, and museum number on the right. Below these there comes space for a description of the specimen, and a line below that is for its location with respect to section and in the section. In case work is to be done on more than one site, and it probably will be, spaces should be allowed for the name and location of the site. A sample Field Catalogue card is shown in Figure 19, a.

[173] In actual practice it is sometimes necessary to modify slightly this system of numbering. However, when the unusual situation ceases to exist, the note pages are renumbered according to the order described.

Three-by-five cards will also be found handy for a Photograph File. There should be space for description of the subject of the picture and data regarding the situation of the subject and the site, similar to that on the Field Catalogue card. A sample Photograph File card is shown in Figure 19, b. While the field photograph number should be a running number, there must also be some other means of identifying the negatives and prints during the process of developing. In the field we have found it helpful to use a five-by-eight card for each film pack or roll. The field photograph numbers are written down the margin of the sheet in a column, while the number of the exposure on each roll or film is written down just inside this column with the subject next it. If you are using a camera with twelve exposures on each roll or pack, exposure six of roll five (written 5–6) will be the fifty-fourth picture taken and will bear the field number 54. The exposure numbers are used only until the rolls or packs are developed. In case your film has no identifying numbers put on by the makers (and some makes do not), you may wish to include small pasteboard numbers in one corner of the picture to help identify the picture. In that case the exposure number will not be necessary. When the films are developed, you will doubtless find several spoiled exposures. We caution you here against throwing away the cards for these exposures. Write boldly across the card with red pencil the word "Spoiled" and put it back in the file. This will save many anxious moments hunting for an unexplained missing number.

Having made the record of the specimens in the notes and in the Field Catalogue, it is necessary that the objects themselves be numbered. It is impractical, if not impossible, to put the field numbers on the specimens while the excavation is actually under way. We mark the field number on a linen tag and put it, together with the specimen, in a small bag, or box. Each specimen and tag should, of course, be put in a separate container. In the evening the specimens can be washed and the numbers applied to them. Incidentally, we put numbers on the specimens with a very small brush or a crow-quill pen, using black or white ink according to the color of the specimen. When the ink is dry we cover the number with a very thin coat of ambroid. We have found this system very successful and quite useful, for when it comes time to apply the museum numbers, the ambroid can be removed with acetone, and the ink with water or ammonia. We usually leave the field numbers on the larger specimens, and this gives us an additional check on the catalogue.

THE SECTION

The excavation of the section provides the key to the secrets of the shell heap. Working in this little bailiwick, the excavator sees the minute details which, when compared with and added to details from other sections, build up the story of the development of the heap. This is the very thing that the archaeologist is after. The section is a rectangle which has a carefully located stake in each corner. On each of these stakes there is a level-mark, the distance of which above some certain point is well known. Using any two of these four points, the worker can locate with a considerable degree of accuracy any desired feature.

There are several things to consider. In starting to dig a shell heap it is advisable, if possible, to find its edge. This should appear when a section containing it is cleaned carefully. The edge will not often appear as a distinct break between shells on one side and soil on the other; rather, there will be a zone in which shells and soil are intermixed. On one side of the zone there will be predominately soil with only scattered pockets of shell, while on the other side there will be a deposit of shells growing in thickness. After describing the character of the zone, we arbitrarily choose points where the conditions in the zone are average and note that these points represent the line of the edge of the heap. We mark this line by means of little pegs placed about every twenty centimeters, or ten inches, apart. In the notes a rectangle the approximate shape of the section is drawn free-hand, and the corners numbered to correspond with the section stakes. The shape of the line indicated by the pegs is sketched across this rectangle. The pegs are then numbered consecutively. Two columns of peg numbers are then made on the notes. Each column is headed with the number of one of the corner stakes. With the tape held as near level as conveniently possible, and with a plumb bob hanging over the stakes, the distance from each one of the numbered pegs to one of the stakes is recorded in the appropriate column in the table. The same thing is done for the measurements from the second stake. This provides measurements which can easily be used in completing the map or in drawing up a small portion of it. An example of this method appears in Figure 22. We find it more convenient and much quicker to take measurements in this way in the field and to draw up the map which is to be used in the report from this information after the work is over. It is almost useless to try to produce a finished map which is ready for publication right on the spot.

This same system can be used not only to draw out the boundary,

but also to record the horizontal distribution of any detail which appears in a section, such as a hearth, or the edge of a particular layer of shells, bones, ash, or humus. In addition to the horizontal distribution of a boundary, a record should be taken of its vertical distribution or depth. If in cross section the line is practically straight, running from one wall to another, nothing but a note of this fact need be made, because the depths will appear in the cross sections. If, however, there are parts of the line which are higher or lower than the ends, a column can be added to the notes and the depth of each peg noted from a single stake. This can be done by using the carpenter's level, chalk-line or

Key to arrangement on note card of measurements for sketch of horizontal boundaries. Place "1" where so marked on card form, and so on.

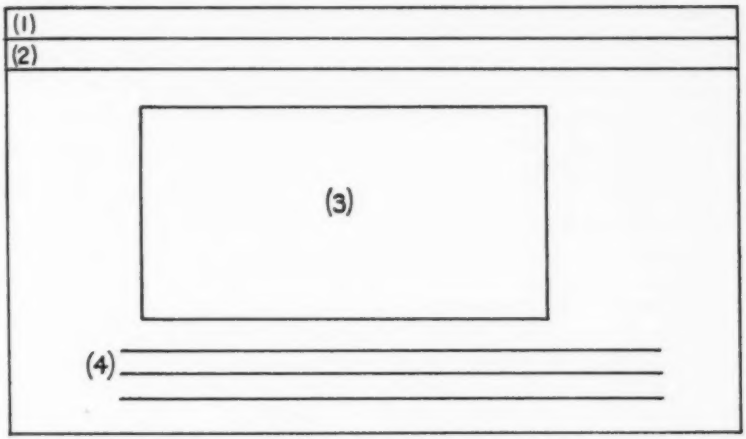
(1.) Sect. IC.1/2E Seaside Shellheap 8/28/37 by D.S.B. p. 11
(2.) Table of Measurements for Hearth 3. cf. p. 10.

(3.)

Peg	From IC/1E	Peg	From IC/1E	Peg	From IC.1/1E	Peg	From IC.1/1E
1	60	11	79	1	117	11	94
2	108	12	92.5	2	138	12	102
3	114.5	13	114	3	131	13	119.5
4	132	14	79.5	4	130	14	118
5	164	15	76	5	146	15	93.5
6	188	16	93	6	166	16	120.5
7	35	17	98	7	106	17	113
8	170	18	94	8	98	18	76
9	79.5	19	117	9	72	19	94
10	105			10	32.5		

(4.) General level of Hearth 3, 12 cm. below IC/1E. Bed of Charcoal and ash slightly higher. Level of Burned Pebbles and Loam slopes upward from IC line, for measurements cf. cross sections on IC and IC.1 lines.

Form for setting up Measurements in Preceding Table.



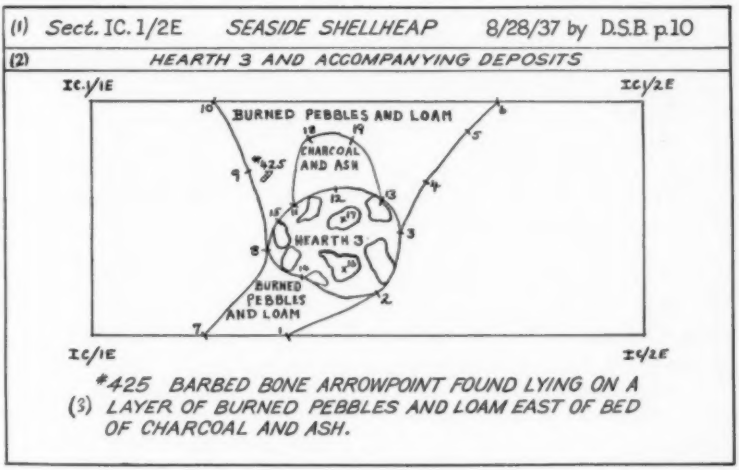

(1) Sect. IC. 1/2E SEASIDE SHELLHEAP 8/28/37 by D.S.B. p.10
(2) HEARTH 3 AND ACCOMPANYING DEPOSITS
IC/1E
IC/2E
BURNED PEBBLES AND LOAM
CHARCOAL AND ASH
#425
HEARTH 3
BURNED PEBBLES AND LOAM
IC/1E
IC/2E
#425 BARBED BONE ARROWPOINT FOUND LYING ON A
(3) LAYER OF BURNED PEBBLES AND LOAM EAST OF BED
OF CHARCOAL AND ASH.

FIG. 22.—Sketch to show method of drawing in horizontal boundaries of layers, and so forth.

straight edge, and rule. This same system can be used to take locations and depths of specimens. It is usually necessary to measure both horizontally and vertically only one part of the specimen.

In regard to the specimens, there is one very important observation which should be added to the measurements. We say again, mention the layer or stratum in which the specimen was found, and any other data about the situation or appearance of the specimen which may be observable. The noting of the stratum in which the specimen is found is really more important than its depth, for the development of the stratum or layer is the information which is being sought, and the measurements are simply aids to its recognition and lucid description in the final report. In actual practice we do not measure the depth of all specimens which can be easily observed to lie in a particular stratum. When a specimen lies in a place which cannot be distinguished easily, or when strata are difficult to identify, we measure its location. We also take careful measurements on specimens for which the cultural identity is not clear, specimens of a type not seen before, or specimens of great cultural significance, in order that we may have a double check upon their exact location. With this information we can be pretty sure of any logical statement we want to make about them, even though such a statement may be at variance with information about similar specimens from other sources.

A word of caution should be added here, printed in red capital letters. Never dig outside a section unless it is absolutely necessary, and even in the event of a seeming necessity try to figure out how a section can be finished before another one is tackled. In digging, keep the three walls of the section as perpendicular as possible and even with the lines between the stakes. Do not burrow but try to keep the floor of the section level at all times. Only in this way can true relationships be determined. In case of a grave, a deposit of pot sherds, or perhaps what seems to be a cache of implements, it may be advisable to stop work on one section and begin on the adjoining one. On making sure that the cross section of the wall is taken, begin a set of notes for the new section and clean the whole off until the level of the desired deposit is reached. After recording the information which is being sought, take the cross section of the wall, adding it to that which has already been taken, and then complete the half-worked section. By going at the work systematically in this way, no information will be lost, as it probably would if a hole were gouged out in an unworked section.

MEASURED DRAWING

If a grave or other complicated deposit appears in a section, a measured drawing is made. For one of these drawings use graph paper, select a workable scale, and locate on the paper either the four section stakes or special stakes conveniently placed. The location of the special or auxiliary stakes in relation to the section stakes should be carefully entered in the notes. Working with a tape and plumb bob, locate certain important points in the deposit. This is done from at least two stakes. When these have been put on the graph paper, such things as bones, artifacts, important stones, and any other features of the deposit can be sketched in. We have found that colored pencils are of some aid in making these field drawings clear. Red has been used for red ochre, yellow for human bones, blue for artifacts, and cross hatched pencil lines for stones.

A measured drawing is properly a delineation of one surface only, and the drawing should not be complicated by attempting to show the location of things which lie beneath this surface. If a lower surface of importance appears after the removal of the upper surface of a deposit, a second drawing should be made. Second drawings are often necessary for deposits which have been built up in layers. For example, bundle burials frequently need a second drawing in order to record accurately the way in which the bones were laid out.

When the deposit has been cleaned and carefully drawn, and a complete description made, together with photographs, it is ready to be removed. Skeletons can be taken out and catalogued usually without more ado, although there are occasions when some particular peculiarity is numbered on the chart and noted as though it were a specimen. The bones of the skeleton which can be saved are, of course, given a Field Catalogue number.

Specimens located on the chart are numbered consecutively. These are removed and catalogued as any specimen would be. For "Situation" on the field catalogue card, we note the deposit number, the number on the measured drawing, and any other information which may serve to show its exact position. It may be found that specimens lie beneath those which appear on the chart. This situation should be described and photographed and, if of importance, it should be drawn before the lower specimens are removed. Artifacts which are only partly covered by the upper artifacts sometimes appear upon additional cleaning of the lower deposits. This makes it possible to include on the chart the exposed parts of these lower artifacts.

In removing material from a deposit of this sort, sequences of photographs are of great help. These should be taken from one or from several points of vantage. In writing the title for the photographs it is important to mention the specimens which are intended to show in the picture and the stage of the cleaning which has been reached. Thus, we have titles such as: "Awl group #216, incl. jaw #219 after cleaning"; "Awl group #216, after removal of tools A to D"; "Awl group #216, after specimens A to G had been removed." Not all of these photographs will be reproduced in the final report, but they will be used a great deal during the process of writing the final description of the deposit.

Key to arrangement on note card of table of measurements for sketch of cross section. Place "1" where so marked on card form, and so on.

(1.) Sect. IC.1/2E Seaside Shellheap 8/28/37 by D.S.B. p. 15
(2.) Cross Section south wall. (3.) Table of Measurements.

(4.)

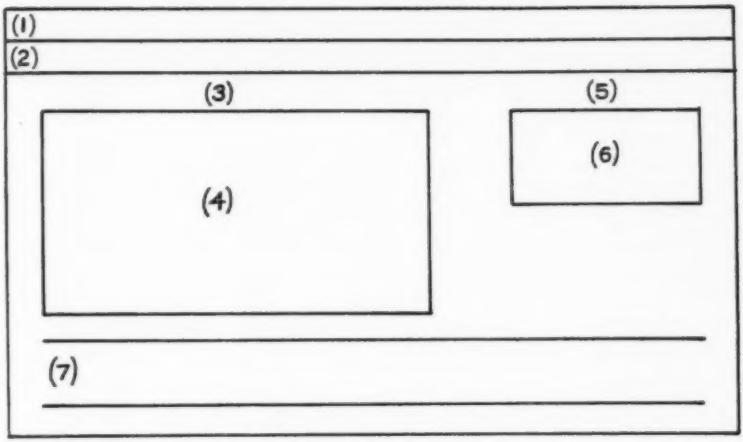
Peg	IC/2E	A	B	C	D	E	F	G	H	I	IC/1E
1	4	3	2	2	2	1	0	0	0	0	0
2	10	8	7	5	5	6	4	4	5	10	11
3	18	15	17	15	15	16	13	14	13	20	18
4	28	27	29	27	27	27	28	30	20	29	29
5	36	37	36	33	31	30	37	31	29	50	40
6	45	49	47	46	44	37	43	35	47		
7	77	71	70	70	64	59		39			

(7.) There are many burned spots in and around "Trampled, burned shells," especially in east. Burned area continues down into "Brown and stained loam." "Clean unbroken shells" end on IC/2E line. They do not extend to the west.
(5.) Table locating special pegs.

(6.)

Peg	From IC/1E	Depth
x	48	32
y	35	20

Form for Setting up Measurements in Preceding Table.



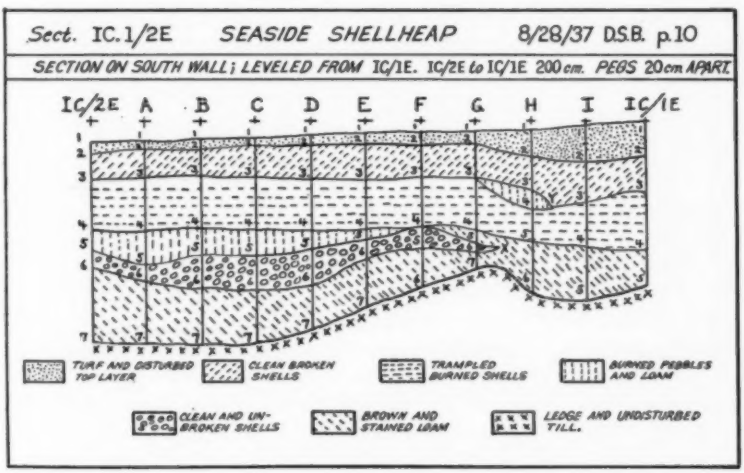

Sect. IC.1/2E SEASIDE SHELLHEAP 8/28/37 D.S.B. p.10
SECTION ON SOUTH WALL; LEVELED FROM IC/1E. IC/2E to IC/1E 200 cm. PEGS 20 cm APART.
IC/2E A B C D E F G H I IC/1E
TURF AND DISTURBED TOP LAYER
CLEAN BROKEN SHELLS
TRAMPLED BURNED SHELLS
BURNED PEBBLES AND LOAM
CLEAN AND UNBROKEN SHELLS
BROWN AND STAINED LOAM
LEDGE AND UNDISTURBED TILL.

FIG. 23.—Sketch of cross section to show method of placing and numbering pegs (no scale used).

CROSS SECTIONS

The cross sections of a shell heap are the principal records from which the excavator reconstructs its development. By means of these it is possible to show the relationship between the layers or strata, or between the various piles of shells. Hearths, "floors," and other phenomena can be shown graphically in the positions in which they were found while excavating.

Before making the measurements, it is wise, if not necessary, to describe the various layers which have been found. This is really a difficult thing to do because it is very easy to get two or more layers confused. We found it confusing to talk about a lower layer and an upper layer because other layers appeared above and below them. We have numbered layers 1, 2, 3, and so forth, and found that this was convenient, although allowing a chance for error. By attaching numbers to layers, one implies a sequence that may prove false when more work is done. Probably the most satisfactory way to keep the layers in order without undue confusion is to name each one with some easily remembered feature which is characteristic of the layer. Thus, our notes contain such names as "mixed shell and humus," "burned shell and ash," "quahog shell layer," and "loose shells." In using one of these terms we have recorded it and a lengthy description of the stratum as soon as it was found as a recognizable layer. Some terms take time to write and are occasionally annoying, but they certainly serve their purpose. They do not suggest any position in the shell heap, and since the layers are located when this term is applied to them, one knows exactly what kind of material is being described.

Taking the cross section is a tedious job which does not produce a specimen and which, during the course of the field work, seems only to delay the progress of the dig. These notes, however, are among the most important which can be taken and more than justify the labor involved. We are not surprised if it takes two men half a day to do one of these, and in rare instances one cross section has required the attention of two men for almost a whole day.

Cross sections should be taken on at least two walls, running at right angles to each other. By doing this it is possible to see in the notes how the shell heap grew. These cross sections also act as a control for everything which has been noted from a section. We take the cross secton on the east wall and on the south wall of every section after it has been excavated, varying this system only where conditions make it absolutely necessary. That is, in Section IC.1/2E (Figure 20) cross sections are

taken on the IC line between IC/1E and IC/2E, and on the 2E line. For the cross section on the south wall, see Figure 23.

In taking a cross section, the chalk line should be stretched between two stakes on a line and leveled from the higher mark. Note should be made of the level mark used, such as "leveled from mark on stake IC/1E." The distance between stakes should also be noted to be sure that they have not been moved by some accident. Next measure off points on the top of the wall. This is done by placing pegs at any convenient interval.[174] Clean the vertical wall with a trowel, and brush it carefully. Try to obtain a face which has dried evenly so that damp places or very dry places will not confuse the appearance of the levels. Beneath each of the pegs on the top, place pegs on the top and bottom of each discernible level, and one at the bottom of the deposit. Sometimes it is convenient to place a peg at the bottom of the excavation, especially if one has dug below the level of the deposit for some particular reason. Frequently a level or a lens will end at a point between two vertical lines of pegs. These points are also pegged out. When all the pegs are in place, sketch or make a diagram of the face, showing where each peg is located. Describe or name layers, using, as far as possible, conventions or colors to distinguish them in the diagram. The pegs are then numbered and the numbers entered on a table which provides a column for the levels which are to be entered (Chart, pp. 208–9). When this is done, measure from the level chalk line to the pegs and enter these measurements in the table. After the levels of the ends of lenses are taken, locate them horizontally from one stake, using the tape and the plumb bob (Chart, pp, 208–9). Occasionally, in excavating a section, a cross section through the middle seems advisable because of some complicated situation. In this case the cross section is made in the same way except that a note of its location, such as, "Section taken 45 cm. north of the IB.1 line in section IB.2/1E," is made at the head of the page. We find it convenient sometimes to make what we call "ideal cross sections." These are simple diagrams which have not been measured but which show the relationship between several phenomena. These will be controlled by the measured cross sections and, when properly annotated, are extremely useful in describing just what was observed.

We have presented the most important methods of recording data which have produced for us a fund of factual information concerning

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[174] We found a twenty-centimeter interval most convenient.

the deposition and characteristics of several shell heaps. We hope that these remarks will be of aid to our many friends who have asked us how to work. The limitations of space make it impossible to answer many questions. For example, we find it impossible to tell anyone how to use a trowel. Such knowledge comes from experience only. What we can say is, be systematic not only in making the record, but in throwing dirt. In beginning to trowel out a section, keep your work clean. The floor of the section should either be level or it should follow carefully the top or bottom of some stratum. The walls of the section should be as straight as is humanly possible, and should be carefully aligned with the lines between the stakes. Back dirt should be removed from the section frequently so that in shovelling it out, the unexcavated portion is not disturbed. Never allow the back dirt to cover the edge of your digging; if you do, you will certainly destroy something with your shovel. Above all be patient and careful; finding specimens is only about one-third of the game. Deposits which contain few if any specimens are often the most important ones. As for being careful, remember that a specimen gouged with the trowel or shattered beyond repair looks rather sorry when placed in your collection. If it is broken, how can you describe it satisfactorily?

While our discussion has been based on shell heap excavation, and our illustrations taken from our work on such sites, these methods can be applied with slight modification to almost any archeological work in the United States. There are types of sites which are not suited to this method, but the majority will be found to be very easily recorded if the principles herein outlined are adhered to.

(NOTE: Due to an editorial error, the matter in the above article charted on pages 204, 208 appears in its present dissociated form, with instructions for compilation, rather than as completed charts. The Editor offers his sincere apologies.)

ARCHAEOLOGICAL RESEARCH IN MEXICO

GEORGE C. VAILLANT[175]

THE ACCOMPANYING map (Plate 10), prepared by Mr. Ignacio Marquina, Chief of the Direction of Prehispanic Monuments, Ministry of Public Education, Mexico, gives a graphic idea of the coördinated research carried on by government and foreign agencies in Mexico. Formal excavation and reconnaissance are being combined to study the origin, development, and diffusion of Mexican cultures, and the burden of the work is being borne by the government archaeologists.

Dr. J. Alden Mason's brilliant analysis of Mexican research in Volume 3, Number 3, of AMERICAN ANTIQUITY, very lucidly sets forth the major archaeological objectives and problems, but the organization of the research may be of interest. Exploration in the north of Mexico, since it involves North American problems, is largely being carried on by American institutions. On the west coast Dr. Isabel Kelly, representing the University of California, excavated in the Culiacan area, and Mr. and Mrs. Gordon Ekholm have surveyed the country from Nogales to Culiacan on behalf of the American Museum of Natural History. Mr. E. B. Sayles of Gila Pueblo, Globe, Arizona, recently completed a reconnaissance in Chihuahua and has in prospect a similar survey of northeastern Mexico. Such investigations are of the highest importance in tying in North American with Mexican archaeological problems.

The Federal District in the Valley of Mexico has been the scene of many major excavations by the Direction of Prehispanic Monuments, and of the stratigraphic studies by Mr. E. Noguera of the Direction, and by the Vaillants, working for the American Museum of Natural History. Lately a concerted effort has been made by government archaeologists to study the relationships of the Valley cultures with those of the surrounding country. In the west we have explorations in the state of Michoacan under the direction of Dr. A. Caso, operating under a special government grant, and in Guerrero Mr. Garcia Payon, of the Direction, has been investigating the cultures of that state and their relationships with the Matlatzinca of the western part of the State of Mexico and the Zapotec of Oaxaca. In Puebla, east of the Valley, Mr. Noguera, of the Direction, has been having conspicuous

[175] Associate Curator of Mexican Archaeology, American Museum of National History, New York City.

success in establishing ceramic chronologies and working out the origins of Mixteca-Puebla culture.

The challenge offered by the complicated archaeological situation in Vera Cruz has also been met by the Direction of Prehispanic Monuments. In the vicinity of Tajin, Messrs. Garcia and Du Solier have been excavating and clearing great groups of buildings with notable success, and Mr. Palacios, with the assistance of Mr. Du Solier, has been working also in the Huaxtec region. The important archaeological district around Tuxtla, in southern Vera Cruz, is being studied by a joint expedition which includes Mr. Garcia of the Direction, Mr. Valenzuela of the National Museum of Mexico, and Mr. Ruppert of the Carnegie Institution of Washington.

In Oaxaca, Dr. Alfonso Caso is at work finishing the excavations of Monte Alban and tracing the Mixteca-Puebla culture to the north, while Messrs. Payon and Noguera have been moving southward to meet him. Mr. M. A. Fernandez has been devoting a season to clearing and studying the important Maya site of Palenque, while up the river in Guatemala territory we find the University of Pennsylvania, under Satterthwaite, continuing excavations at Piedras Negras.

The map shows how closely integrated these various projects are and how no one is completely isolated from the general attempts at solving Mexico's archaeological problems. Mr. Toro, the head of the Department of Monuments, and Mr. Marquina have developed a cooperative plan for archaeological research which in its utilization of local and foreign students is without parallel in the history of New World archaeology. Let us hope that this program may continue to bring out new and interesting information on this rich and important field.

PLANO QUE INDICA LOS CENTROS ARQUEOLOGICOS MAS IMPORTANTES Y LAS EXPLORACIONES EMPRENDIDAS POR LA DIRECCION DE MONUMENTOS PREHISPANICOS, LA INSTITUCION CARNEGIE DE WASHINGTON, EL MUSEO DE HISTORIA NATURAL DE NEW YORK, LA UNIVERSIDAD DE CALIFORNIA Y LA DE GLOBE, ARIZONA, CON EL OBJETO DE RELACIONAR ENTRE SI LOS CONOCIMIENTOS ADQUIRIDOS.

ARQ. IGNACIO MARQUINA

INDICACION:
① Exploración del Departamento de Monumentos Prehispánicos.
② " del Museo de Historia Natural de New York
③ Exploración del Departamento de Monumentos
④ " " " " "
⑤ Exploración del Departamento de Monumentos en colaboración con la Institución Carnegie de Washington.
⑥ Exploración del Departamento de Monumentos.
⑦ " de la Institución Carnegie de Washington.
⑧ " de la Universidad de Globe, Arizona.
⑨⑩ " del Lic. Alfonso Caso
⑪ " de la Universidad de California y del Museo de Historia Natural de New York
⑫ " de la Institución Carnegie de Washington
⑬ " del Departamento de Monumentos
Centros Arqueologicos
Capitales de algunos Estados.
Dirección de exploraciones.
MATAMOROS
MONTERREY
SALTILLO
VICTORIA
SAYLES
ZACATECAS
TAMPICO
CEBADILLA
S. LUIS
AGUAS CALIENTES
PALACIOS Y DUSOLIER
GARCIA Y DUSOLIER
EL TAJIN
YOHUALICHAN
VAILLANT
CALIXTLAHUACA
PACHUCA
TEOTIHUACAN
ZACATENCO
MEXICO
CUICUILCO
PUEBLA
ACATLAN
TEPEACA
TEHUACAN
VERACRUZ
EL TEJAR
TUXTLA
COMALCALCO
ROBERTS
MERIDA
UXMAL
CHICHEN-ITZA
TAYIL
KABAH
TULUM
CAMPECHE
OCTZNA
RUPPERT
CALAKMUL
PALENQUE
FERNANDEZ
TUXTLA
VALLE DE BRAVO
LAS PAROTAS
TOLUCA
MALINALCO
XOCHICALCO
NOGUERA
ARCELIA
GARCIA PAYON
CHILPANCINGO
SILACAYOAPAN
YUCUÑUDAHUI
TEXMILINCAN
QUIOTEPEC
OAXACA
MITLA
MONTE ALBAN
VALENZUELA RUPPERT Y GARCIA
CASO
G. VELAZQUEZ C. 1937

UNIV. OF MICH.

ABORIGINAL CAMP SITES ON ISLE ROYALE, MICHIGAN

GEORGE I. QUIMBY, JR.[176]

IN A RECENT article in AMERICAN ANTIQUITY, Dr. Vladimir J. Fewkes described some Woodland pottery from the valley of the lower Red River, north of Winnipeg, Manitoba.[177] Similar sherds from the region of Mille Lacs, Minnesota, are illustrated by Winchell.[178] As pointed out by McKern[179] and Fewkes,[180] pottery resembling the Woodland ware was collected from sites in Kamchatka, Siberia, by Jochelson. There is some possibility that these northern Kamchatka sites date after the tenth or eleventh centuries A.D.[181]

Pottery of the same kind mentioned for Red River and Mille Lacs is also found on Isle Royale, Michigan. This Woodland ware on Isle Royale is associated with an Iroquoian type of pottery which also has been reported from Lake Nipigon by Holmes[182] and has been found at Sault Ste. Marie, Michigan.[183] Pottery resembling this Iroquoian type is also found in the northern Kamchatka sites and is illustrated by Jochelson.[184] The Isle Royale Iroquoian sherds most closely resemble a western New York ware[185] which in historical horizons is probably Neutral or Erie.[186]

One would probably guess that the Iroquoian pottery in the Lake Superior region had diffused from New York. However, the fact that

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[176] University of Chicago, Ann Arbor, Michigan.

[177] Fewkes, Vladimir J., Aboriginal Potsherds from Red River Manitoba. This series, Vol. 3, No. 2, October, 1937.

[178] Winchell, N. H., The Aborigines of Minnesota. St. Paul, 1911.

[179] McKern, W. C., An Hypothesis for the Asiatic Origin of the Woodland Culture Pattern. This series, Vol. 3, No. 2, October, 1937.

[180] Fewkes, V. L., *ibid.*

[181] Jochelson reports Japanese coins of the tenth or eleventh centuries A.D. associated with indigneous materials in the northern Kamchatka sites. In addition to the coins there were other objects such as porcelain indicative of Japanese cultural contact. Jochelson, V. II., Archaeological Investigations in Kamchatka, p. 64, Washington, 1928.

[182] Holmes, W. H., Aboriginal Pottery of the Eastern United States. 20th Annual Report of the Bureau of American Ethnology, 1903.

[183] Catalogue number 897, Museum of Anthropology, University of Michigan.

[184] Jochelson, V. II., *ibid.*, Plate 19-B.

[185] From photographs of the Isle Royale Iroquoian pottery, identification was made by Dr. A. C. Parker and Mr. William Ritchie who pointed out its close resemblance to the pottery of the Neutrals and Eries of western New York (January, 1937).

[186] Parker, A. C., Erie Indian Village and Burial Site at Ripley, New York, Bulletin 117, New York State Museum, Plates 26 and 29.

Iroquoian and a particular kind of Woodland pottery are associated together on Isle Royale, and that, although incompletely described, there seems to be a somewhat similar association in Kamchatka, Siberia, should be kept in mind. Since there is the interest in the possible Asiatic origin of the Woodland Pattern, it does not seem out of place to present the above information, such as it is, with the hope of obtaining further evidence, positive or negative, from Asia or northwestern Canada.

The primary purpose of this paper is to present an analysis of the pottery and other artifacts from three camp sites on Isle Royale, Michigan. These sites, all in the northeastern half of the island, are the Indian Point site, the Linklater site on Birch Island in McCargoe's Cove, and the Johnson site at Chippewa Harbor. The materials studied were collected by the McDonald-Massee Expedition in 1928,[187] Mr. Fred Dustin in 1929,[188] and Dr. C. E. Guthe in 1930.[189]

Upon all three camp sites, the evidence of human occupation was either on the surface or confined to a shallow stratum immediately beneath the surface, or both. At the Johnson site, the stratum varied in thickness from five to ten inches and was composed of dark humus; at the Linklater site, the stratum was composed of gray-brown humus ten inches thick; and at the Indian Point site the refuse of occupation was on the surface of a stratum of gravelly sand beneath two to four inches of leaf mould and moss.

Both the Woodland and Iroquoian types are represented in the surface collections from the Johnson and Indian Point sites, and seem to have been scattered throughout the refuse bearing layer, entirely without stratification. At the Linklater site, only the Woodland sherds were found in the refuse-bearing stratum and upon the surface.

The Iroquoian-like pottery from Isle Royale (Plate 11, Figure 1) has the following characteristics. It is grit-tempered, the aplastic being granitic in character. The texture is medium-fine to medium, and the surface hardness ranges from 2–2.5 to 5, with about forty-three per cent of the sherds harder than 2.5.[190] The surface finish is very smooth, but

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[187] West, George, Report of the McDonald-Massee Isle Royale Expedition. Vol. 10, No. 1, Bulletin, Public Museum of the City of Milwaukee, 1930.

[188] Dustin, Fred, A Summary of the Archaeology of Isle Royale, Michigan. Papers of the Michigan Academy of Science, Arts and Letters, Vol. 16, published 1932.

[189] Unpublished field notes of C. E. Guthe.

[190] A similar range and distribution of hardness resulted from the analysis of a small group of sherds from the Richmond Mills site, Ontario County, New York.

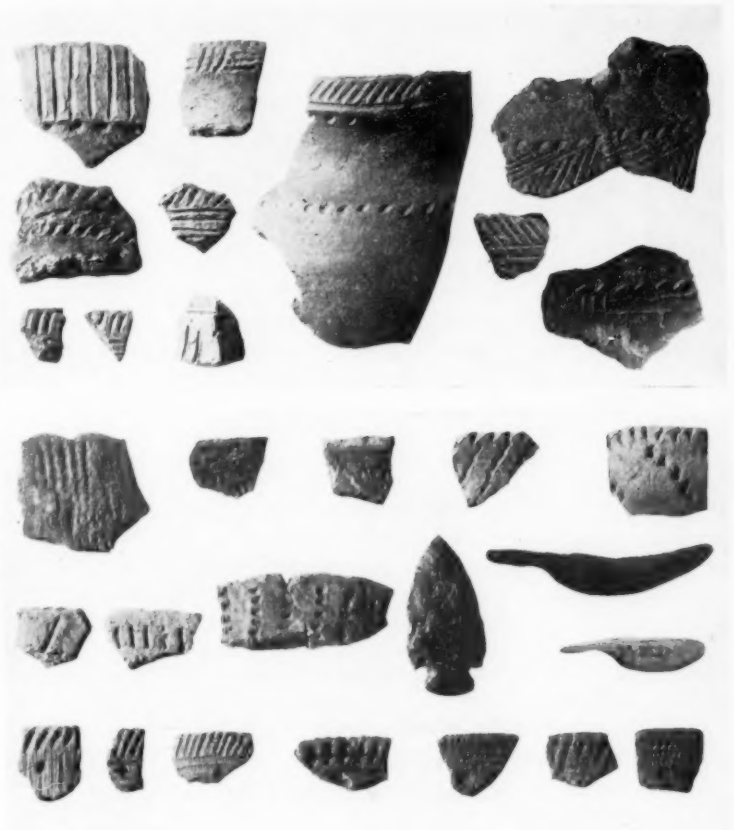

FIG. 1.—Iroquoian-like sherds.
FIG. 2.—Woodland-like sherds.

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not polished or burnished. The color ranges in tans and grays, with frequent blackening from smoke.

In form, the rim is predominantly straight and vertical, although there is one instance of a straight to slightly flaring rim. Weak castellations and thickening of the upper rim occur in a few cases. The lip is flattened and smoothed, with slightly rounded edges, and is slightly in- or out-sloping. The shape of one rimsherd offers the possibility of a square-mouthed, collared vessel. Generally the lip thickness coincides with that of the rim.

The upper shoulder area is always constricted, and the shoulder slope more nearly approaches a horizontal plane, as opposed to the vertical approach of the plane of the shoulder in the Woodland pottery of Isle Royale. These pots were probably round-bottomed, although only one sherd is large enough to suggest the bottom curve.

Decoration upon this pottery is confined to the lip, the outside of the rim, and the shoulder area. The methods used are incising, punctating, and impressing with a stick. The last mentioned is present in few cases and only on the outer edge of the lip. Its use produces a pattern of small, somewhat closely spaced notches. Occasionally the lip is decorated with shallow, narrow, somewhat closely spaced, transverse, incised lines. More often the lip is undecorated.

Patterns used on the rim consist of the following combinations: (1) shallow, narrow incised lines about 1 cm. long placed obliquely from right to left and parallel to each other in a band encircling the rim directly beneath the lip, and terminating in, or a few millimeters above, one or more encircling incised lines horizontally placed, or an encircling row of punctate impressions; (2) encircling bands of incised geometric plats filled with shallow, narrow, parallel incised lines which are also parallel to one side of the geometric figure, whether it be triangular, rectangular, or some other form; (3) encircling parallel, shallow, narrow incised lines horizontally placed; and (4) an encircling band of shallow, wide, somewhat closely spaced incised lines vertically placed on the rim and parallel to one another.

In addition to the pattern described above under (2) the following design combinations are present on the shoulder area: (1) an encircling band of shallowly incised, widely spaced, short parallel lines in groups at right angles to longer parallel, horizontal lines; and (2) an encircling row of small, round triangular or ovoid punctations.

The Woodland pottery from the Johnson, Indian Point, and Link-later sites (Plate 11, Figure 2) has the following characteristics. It is grit

tempered with a granitic aplastic, and there is an even distribution in texture from medium-fine to medium. The surface hardness ranges from 2 to 2.5 with about seventy-five per cent of the sherds harder than 2

FIG. 24.—Sherd Cross Sections: upper row, Iroquoian-like sherds; middle and bottom rows, Woodland-like sherds. The outer sides are to the right.

and softer than 2.5. The color ranges are in tans and grays. A considerable number of sherds are blackened both inside and out with smoke. Only about twelve per cent of the sherds have a smooth surface finish,

and this smoothness is of a lesser degree than that of the Iroquoian-like sherds. The most common surface finish is that produced by paddling with a cord-wrapped paddle, although this is frequently smoothed to some degree.

The shape of this type of pottery, as indicated by the rim and body sherds, is as follows. The rim is straight and vertical, or straight to slightly flaring, and in two instances weakly castellated. The lip is rounded and flattened, the latter due to the application of design or surface treatment, and sometimes slightly everted at both edges. Occasionally the lip is rounded, or narrowed and rounded. The upper shoulder area seems to be constricted and the plane of the shoulder slope generally is toward the vertical, or at least farther removed from the horizontal than is that of the shoulders of the Iroquoian sherds. The curves of occasional body sherds suggest a semi-conoidal base for this type of pottery. The lip thickness is frequently a few millimeters greater than the rim thickness, except when the lip is narrowed and rounded (Figure 24).

Decorating techniques include finger impressions which are confined to the lip, and when sufficiently deep, produce a crenulated effect; impressing with stick, cord-wrapped stick, and cord-wrapped paddle; punctating; dragging or trailing with stick and with cord-wrapped paddle; stamping with a wedge-shaped object; and in one instance, stamping and dragging with a comb. Decoration may appear upon the rim, both outside and inside, and on the lip. No decoration appears upon the body except the surface finish produced by malleating with a cord-wrapped paddle. Decoration would probably be a secondary function of this treatment.

The most common decorative pattern consists of encircling bands of short (about 1 cm.), closely spaced or contingent cord-wrapped stick impressions, parallel to one another, and obliquely placed from right to left immediately beneath the lip. These may terminate in or just above one or more horizontal encircling single cord imprints, or a row of small round punctations, or both. Generally when this cord-wrapped stick pattern is present on the outer rim, it also occurs (transversely) upon the lip and vertically on the inside of the rim. This type of decoration is usually applied to a surface which has been poorly smoothed subsequent to a tooling process by means of the cord-wrapped paddle. Cord-wrapped stick notches on the outer edge of the lip occur in one instance.

Frequently rims have no decoration other than the cord-wrapped paddle impressions, although the lip may have either transverse, closely

spaced, or contingent cord-wrapped stick impressions, and the inside of the rim may be decorated with an encircling band of cord-wrapped stick impressions arranged like those mentioned in the preceding paragraph.

Less common is the pattern consisting of an encircling band or bands, arranged one above another, of short, somewhat closely spaced impressions produced by stamping with some wedge-shaped object. These impressions are vertically or obliquely arranged, and in either case parallel to each other. This type of decoration appears upon the inside of the rim as well as the outside, and may appear transversely across the lip. The design occurs upon a poorly smoothed surface.

Other patterns appearing on rims are vertical rows of medium-large rectanguloid punctations, the rows medium-closely spaced and parallel to one another; an encircling band of widely spaced, oblique stick impressions; and a similar type in which the stick is dragged instead of impressed. For all three of these types, the same decoration may appear upon the lip.

A percentage comparison of Woodland and Iroquoian-like pottery gives the following results:[191]

	All Sherds		Rim Sherds	
Woodland	135	79%	28	72%
Iroquoian	35	21%	11	28%
	170	100%	39	100%

The Woodland pottery is more abundant than the Iroquoian and, as stated before, the two seem to be directly associated. Further, the small number of artifacts from the pottery-bearing sites would seem most typical of the Woodland Pattern.

Artifacts other than potsherds include the following.[192]

Johnson Site: one fragment of a copper implement, a copper knife 6.3 cm. long with a greatest width of 1.4 cm.[193] (Plate 11, Figure 2), a similar copper knife 9.5 cm. long with a greatest width of 2 cm. (Plate

[191] Insofar as possible sherds from individual vessels are represented.

[192] Artifacts collected by the McDonald-Massee Expedition are not included since they have already been described in the report of that expedition. Bulletin of the Public Museum of the City of Milwaukee, Vol. 10, No. 1.

[193] This copper knife, the smaller of the two, was found in a pit which was about fifteen inches in diameter at the bottom of the refuse-bearing stratum and extended below this about ten inches. The pit may or may not have extended from the ground surface. Associated with the copper knife were two body sherds, one rim sherd which is of the Iroquoian type, and fragments of unidentifiable burned animal bone.

TABULAR COMPARISON OF POTTERY FROM ISLE ROYALE, MICHIGAN

Characteristics	Iroquoian	Woodland
Paste		
Temper		
Grit, granitic	x	x
Texture		
Med. fine-med.	x	x
Hardness		
Range 2–2.5		x
2–2.5 to 5	x	
Color		
Tans and grays	x	x
Surface Finish		
Very smooth	x	
Poorly smoothed		x
Cord-wrapped paddle		x
C.w.p. smoothed		x
Decoration		
Technique		
Incising	x	
Punctating	x	x
Impressing stick	x	x
Impressing finger		x
Impressing cord-w. stick		x
Impressing cord		x
Impressing wedge stamp		x
Impressing comb		x
Impressing cord w. paddle		x
Dragging stick		x
Dragging comb		x
Dragging c.w.p.		x
Design Elements		
Rims		
Geomet. plats	x	
Encircling bands of right to left slanting lines	x	x
Horizontal encircling lines	x	x
Encircling rows punct.	x	x
Horizontal rows punct.		x
Lip		
Notching outer edge	x	x
Transverse parallel lines	x	x
Punctate	x	x
Cord-wrapped paddle		x
Finger depressions		x
Inside Rim		
Encircling bands of right to left slanting lines		x
Shoulder		
Geometric plats	x	
Horizontal rows punctate	x	
Rim		
Straight vertical	x	x
Straight to slightly flaring	x	x
Weakly castellated	x	x
Lip		
Flattened	x	
Rounded & flattened		x
Narrowed & rounded		x
Thickness: lip to rim		
About the same	x	
Lip slightly thicker		x
Upper Shoulder		
Constricted	x	x
Plane toward horizontal	x	
Plane toward vertical		x
Base		
Rounded?	x	
Semi-conoidal?		x

11, Figure 2), two small, retouched-flake knives or scrapers, a fragment of a dog mandible,[194] and two seeds of the American Lotus (*Nelumbo lutea*).[195]

Indian Point Site: five fragments of copper implements, one roughly trianguloid chipped-flint scraper, a number of flint flakes, three hammer-stones, and fragments of bones from moose (*Alce americanus*) and beaver (*Castor canadensis*), some of which are charred slightly.

Linklater Site: one trianguloid retouched-flake scraper or knife, a narrow, ovate, dark brown flint, projectile point with a convex base and corner notches (length 7 cm., greatest width 3.5 cm.), and a smoothed circular stone implement 6.5 cm. in diameter and 3 cm. thick. The edges of the latter show evidence of grinding, and the center of one face is slightly pitted.

Probably none of the Isle Royale sites can be culturally identified by direct historical methods. There is no historical evidence to support the fact that ethnically known Iroquoian peoples were actually on Isle Royale, although there is evidence of their being in the general Lake Superior region.[196] In 1649, there were three hundred Huron families on St. Joseph Island in upper Lake Huron.[197] Father C. Allouez reported that there were Hurons in the region of La Pointe in 1667,[198] and Father Marquette stated that there were four or five hundred Tionnontateheronnons near La Pointe in 1670.[199] Nicolas Perrot indicates that in 1662[200] one hundred Iroquois men went above Sault Ste. Marie and proceeded to camp at the mouth of Lake Superior.

Other tribes in the general region were the Chippewa and Cree. In 1669, Dablon reported the presence of Cree Indians at Sault Ste. Marie. In that same year, Marquette reported Cree in the region northwest of the Mission of Saint Esprit.[201]

Thus there were ethnically known Iroquois and Algonquian peoples in the Lake Superior regions, but there is no historical evidence to show that they were ever on Isle Royale.

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[194] Identification of animal bone by Museum of Zoology, University of Michigan.

[195] Identification made in Ethnobotanical Laboratory, Museum of Anthropology, University of Michigan.

[196] Ethno-historical references supplied by Mr. W. Vernon Kinietz, Museum of Anthropology, University of Michigan.

[197] Jesuit Relations, ed. R. G. Thwaites, Vol. 34, p. 223.

[198] *Ibid.*, Vol. 50, p. 307.

[199] *Ibid.*, Vol. 54, pp. 169–171.

[200] Blair, E. H., Indian Tribes of the Upper Mississippi, Vol. I, p. 179.

[201] Jesuit Relations, Relation of 1669–70, Vol. 54, pp. 133–135; 193–195.

The location of the camp sites is intimately related to the many prehistoric copper pits in the vicinity. While it is not certain, it is quite probable that the people responsible for the camp sites also operated the copper pits in proto-historic times. Objects of a perishable nature such as wood and bark have been found in the copper pits,[202] and Iroquoian-like pottery, which in the East might border upon the historical horizon, is found associated with the camp site material. The fact that copper implements made from Isle Royale copper are found in numerous cultures does not indicate great age, because none of these cultures (including the Hopewellian) has been demonstrated to be of great antiquity.

Further, there is the coincidence of Iroquoian-like pottery in Kamchatka, where it is associated geographically with a Woodland-like pottery. This coincidence could bear further inquiry inasmuch as attention has already been focused upon northwestern America and northeastern Asia in connection with McKern's hypothesis for the origin of the Woodland Pattern.

[202] Quotation from George Fox in The Report of the McDonald-Massee Isle Royale Expedition, Bulletin of the Public Museum of the City of Milwaukee, Vol. 10, No. 1.

THE REDUCING ATMOSPHERE AND OXIDIZING ATMOSPHERE IN PREHISTORIC SOUTHWESTERN CERAMICS

HAROLD S. COLTON[203]

IT IS A well known fact that the surface color of pottery made by the ancient inhabitants of the Southwest occurs (1) in shades of white and gray and also (2) in shades of red, yellow, and brown. That the differences in color between the white and gray pottery and the others are due to a difference in firing technique is not so widely known.

My attention was drawn to this question on a winter morning nine years ago just after my house burned down. Among the ruins I discovered that a yellow Hopi jar which the night before had been standing on a mantelpiece had turned a cold gray. On the other hand, a number of Hopi bowls that were stored in a window seat were still yellow. This observation led to thoughts. Thoughts led to experiments. The present paper is the result. Like the Chinaman in Lamb's *Essay on Roast Pig*, I had to burn down the house to get the idea. Although the phenomenon described above is well known to potters and to anyone who has studied elementary chemistry, it seems to be unknown to most archaeologists. This paper presents nothing new, but calls attention to well known facts applied to a specific problem.

Readers who have studied elementary chemistry will remember that the flame of a Bunsen burner is composed of three parts: an inner cone in which the gas is unburned, a middle cone which is blue and in which the gas is incompletely burned because of lack of oxygen, and an outer shell where combustion is complete and oxygen is in excess. The inner cone is called a reducing flame because, due to the lack of excess oxygen, oxides are often "reduced" to lower oxides or to a metal. The outer cone is called an oxidizing flame because the atmosphere has an excess of oxygen; in an oxidizing atmosphere many compounds containing little or no oxygen will tend to combine with oxygen-forming oxides.

Ceramic technologists[204] have long studied the effects of these two atmospheres on clays heated to different temperatures. A reducing atmosphere is produced by enclosing the sample so as to keep out air, at the same time supplying an atmosphere of hydrogen, an atmosphere of some hydrocarbon, or an atmosphere of carbon monoxide produced by charcoal or damp sawdust. On the other hand, an oxidizing atmo-

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[203] Director, Museum of Northern Arizona, Flagstaff, Arizona.

[204] Wilson, 1927.

TABLE I

WHITE OR GRAY POTTERY TYPES TESTED BEFORE A BLOW PIPE IN OXIDIZING ATMOSPHERE

Pottery type	N. A. (1) Site number	A. T. (2) Sherd number	Drainage	Surface or core	Color before firing (3)	Color after firing (3)	Color changed from (4)
Bidahochi Black-on-White	1054	1078	Upper Cottonwood	S	9AI	11B3	White to cream
Deadmans Black-on-gray	2052	1026	Deadmans	C	12A2	12J9	Gray to brown
Deadmans Gray	1238	2391	Deadman	C	14A1	12C6	Slate gray to orange
Dogozshi Black-on-white	2707	59	Tsegi-at-Sosi	C	27A1	3C9	Pale gray to orange
Kayenta Black-on-white	2531	3091	Tsegi	C	43A3	10F2	Gray to pale yellow
Klageto Black-on-white	1015	1405	Upper Le Roux	S	43B1	12B4	Gray to yellowish gray
Little Colorado Corrugated	1017	1656	Upper Le Roux	C	136D	12E6	Yellow-gray to pink
Moenkopi Corrugated	1712	494	Oraibi	C	19A1	12I9	Gray to brown
Pinedale Black-on-white	1069	1681	Silver Creek	S	11A1	11A4	Pale gray to pale rose
Pinedale Black-on-white	1069	1680	Silver Creek	S	11A2	11C5	Pale gray to pale pink
Walnut Black-on-white	700	1489	Lower Walnut	C	44A1	10F7	Gray to apricot

Notes: (1) Number of site in Archaeological Survey, Museum of Northern Arizona.
(2) Sherd number in collection of type, co-type, and topotype sherds in the collection of the Museum of Northern Arizona.
(3) Color symbols from *A Dictionary of Color*, by Maerz and Paul, 1930.
(4) The colors in this column are approximate and have no relation to the *Dictionary of Color*.

sphere is present when a current of air flows across incandescent clay at temperatures between 350° C. and 950° C.

The element which colors the surface of prehistoric pottery in the Southwest, other than carbon, lead, or copper, is the limonite (or yellow ochre) which gives the clay a yellow color, as iron sesquioxide (hematite) which gives the clay a reddish or a brownish color, or as ferrous oxide or other ferrous salts which color the clay a gray or greenish tint.

Ceramic technologists[205] have found that, fired in an oxidizing atmosphere, clays with less than one per cent of iron burn nearly white; one per cent to three per cent of iron, burn buff; over three per cent, they burn red to brown. In a reducing atmosphere, clays with less than one per cent of iron burn white; one per cent to three per cent, burn gray; over three per cent, dark gray to black. The firing temperature also affects the shade of the color.

Certain prehistoric people of the Southwest consciously, and sometimes unconsciously, made use of oxidizing and reducing atmospheres in firing their pottery. The modern Pueblo Indians, and all other Indians in North America, fire their pottery in an oxidizing atmosphere so that their pottery is in general yellow, brown, or red.

The area in which the reducing atmosphere was consistently used was quite limited. Before 1100 A.D., it was confined to the northeastern portion of Arizona, northwestern New Mexico, southwestern Colorado, and southern Utah. If you take a compass and circumscribe a circle with the center at the point where the four states meet, and with a diameter of two hundred miles, it will include most of the area where the reducing atmosphere was used. During the twelfth century the method spread south, but after 1300 it was given up all over the area, except in the Upper Rio Grande Valley where the method was used for a hundred years longer.[206]

Although the present paper makes no new contribution, because the effects of firing atmospheres on pottery have long been known, yet it is necessary to distinguish oxidizing and reducing atmospheres because they are basic techniques and, therefore, of importance to archaeologists and others concerned with studying material culture.

By means of the blow pipe and the use of a combustion furnace fitted with a pyrometer, the author has tested a number of Southwestern pottery types to determine how they were fired. In the early

[205] Wilson, 1927.
[206] Shepard, 1936.

TABLE II

WHITE OR GRAY POTTERY TYPES FIRED IN AN OXIDIZING ATMOSPHERE IN A COMBUSTION TUBE AT A TEMPERATURE BETWEEN 800° C. AND 900° C.

Pottery type	N. A. (1) Site number	N. A. (2) Sherd number	Drainage	Surface core	Temp.	Color before firing (3)	Color after firing (3)	Color changes from (4)
Adamana Brown	1318	884	Little Colorado	S		12A1	12D9	Dark gray to orange
Arauca Polychrome	1023	2061	Little Colorado, Petrified Forest			10A2	10A2	White—unchanged
Arauca Polychrome	1023	2061	Little Colorado, Petrified Forest			10A2	10A2	White—unchanged
Arauca Polychrome	1023	2075	Little Colorado, Petrified Forest			9A1	9B 2	White to cream
Arauca Polychrome	1023	2075	Little Colorado, Petrified Forest			14A1	11D4	Gray to buff
Coconino Gray	1570A	456	Kana-a	S		12A2	11C6	Gray to pink
Deadmans Fugitive Red	186	2409	Deadman	S	890°	13A2	12C7	Gray to pink
Dogoszhi Black-on-white	2525	50	Dogoszhi Beko	S	890°	10A1	11D5	Gray to pale pink
Flagstaff Black-on-white	812	4274	Moenkopie	S		11A2	11D6	Pale gray to buff
Holbrook Black-on-white		1581	Rio Pueblo Colorado	S		17B1	11F7	White to buff
Holbrook Black-on-white		1581	Rio Pueblo Colorado	C		14A1	11E5	Gray to buff
Kana-a Black-on-white	2614	42	Tsegi	S		11A1	11E3	Pale gray to pale buff
Kana-a Black-on-white	2711	45	Tsegi-at-Sosi	S		10A1	11B3	Pale gray to pink
Kayenta Black-on-white	2519	3077	Tsegi	S	890°	13A2	11C3	Gray to pale pink
Lino Gray	1130	2	Lower Jeddito	C		11A2	11C5	Pale gray to pale pink
Lino Gray	3159	387	Upper Virgin	S		12A2	10C5	Gray to pink
Mimbres Bold Face Black-on-white	898	4747	Mimbres	S	900°	11B4	10D5	Cream to orange
Mimbres Bold Face Black-on-white	898	4753	Mimbres	S	900°	9A1	10C4	White to pale yellow
Mimbres Classic Black-on-white	898	4750	Mimbres	S	900°	9A1	9C4	White to pale yellow
Mimbres Classic Black-on-white	898	4750	Mimbres	C	900°	11B3	11E7	Pink to orange
Mimbres Classic Black-on-white	898	4751	Mimbres	S	900°	9B4	11B4	White to cream
Mimbres Classic Black-on-white	898	4751	Mimbres	C	900°	38B2	12D9	Gray to cream
Mimbres Classic Black-on-white	898	4749	Mimbres	S	900°	9B4	11D7	White to yellow
Mimbres Classic Black-on-white	898	4749	Mimbres	C	900°	44A1	13D7	Gray to orange
North Creek Black-on-white	3568	272	Upper Virgin	S	860°	11B3	11C6	Gray to buff
North Creek Black-on-white	3568	272	Upper Virgin	C	860°	13A1	12D8	Gray to reddish brown
North Creek Corrugated	3553	633	Upper Virgin	S	860°	10B2	10C4	Pale gray to buff
North Creek Gray	3558	404	Upper Virgin	S	860°	11A1	11E6	Gray to buff
St. George Corrugated	3569	725	Upper Virgin	S	860°	10B2	10D5	Pale gray to buff
Three Circle Bold Face Black-on-white		4685	Mimbres	S	890°	10A1	11E5	White to pale pink
Tsegi Gray	2721	1023	Tsegi-at-Sosi	S		10A1	9B2	White to cream
Tsegi Gray	2721	1023	Tsegi-at-Sosi	C		14A1	10D3	Gray to buff
Tusayan Corrugated	1244	555	Deadman	S		12A2	11D10	Gray to pale orange
Virgin Black-on-white	3568	248	Upper Virgin	S	860°	9A1	9B4	White to pink
Virgin Black-on-white	3551	381	Upper Virgin	S	860°	13A3	13E8	Gray to orange
Virgin Black-on-white	3568	253	Upper Virgin	S	860°	11A2	11C4	Gray to buff
Walnut Black-on-white	700	1489	Lower Walnut	S		10A1	10A1	White—unchanged
Walnut Black-on-white	700	1489	Lower Walnut	C		14A1	12J8	Dark gray to orange
Walnut Black-on-white	700	1500	Lower Walnut	S		10A1	10A1	White—unchanged
Walnut Black-on-white	700	1500	Lower Walnut	C		22A1	12J10	Gray to orange
Wide Ruin Black-on-white	1016	1398	Upper Le Roux	S	890°	14A1	12F8	Dark gray to orange
Winslow Polychrome	875	2393	Upper Rio Grande	S	890°	14A1	11E8	Dark gray to pale orange

TABLE III

YELLOW, RED OR BROWN POTTERY TYPES TESTED IN A REDUCING ATMOSPHERE BEFORE A BLOW PIPE

Pottery types	N. A. (1) Site number	A. T. (2) Sherd number	Drainage	Surface or core	Color before firing (3)	Color after firing (3)	Color changed from (4)
Flagstaff Red	660	2940	Rio de Flag	S	6B11	30A1	Brick red to gray
Jeddito Black-on-yellow	1019	2734	Upper Jeddito	S	9D3	35A1	Cream to gray
Jeddito Black-on-yellow	1019	2745	Upper Jeddito	S	11H6	38A1	Yellow to gray
Jeddito Tooled	820	2675	Upper Jeddito	S	9D3	36A1	Cream to gray
Kiet Siel Polychrome	1519	2589	Oraibi	S	6F12	39A3	Red to dark gray
Pinedale Black-on-red	1069	1721	Silver Creek	S	5F11	38A2	Red to gray
Tsegi Orange	2504	2524	Tsegi	S	12C8	38A1	Yellow to gray
Turkey Hill Red	660	2984	Rio de Flag	S	6B11	39E5	Brick red to dark gray
Winslow Black-on-orange	953	1152	Little Colorado, Winslow	S	10E7	38A2	Apricot to gray

TABLE IV

RED, YELLOW OR BROWN POTTERY TYPES FIRED IN A REDUCING ATMOSPHERE IN A COMBUSTION TUBE AT TEMPERATURES 860° C. TO 970° C.

Pottery types	N. A. (1) Site number	A. T. (2) Sherd number	Drainage	Surface or core	Temp.	Color before firing (3)	Color after firing (3)	Color changed from (4)
Bidahochi Polychrome	952	1076	Little Colorado, Winslow	S	930°	3A10	6A1	Yellow to gray
Black Axe Polychrome	1020	4162	Little Colorado, Petrified Forest	S	930°	4A10	39A1	Rose to gray
Bluff Black-on-red	2659	2435	Lower San Juan	S	930°	5D11	38B2	Red to gray
Deadman Black-on-red	862	2197	Deadman	S	930°	5E11	39A4	Red to gray
Deadmans Black-on-red	862	2207	Deadman	S	930°	5F11	39A1	Red to gray
Deadmans Black-on-red	862	2196	Little Colorado, Leupp	S	970°	6D11	47A5	Red to dark gray
Dogozshi Polychrome	2504	437	Tsegi	S	930°	5H10	40H1	Red to black
Hopi Pottery from Hano	—	—	Polacca	S	930°	11H9	10A1	Orange to white
Jeddito Corrugated	1019	2641	Silver Creek	S	930°	12B6	47A3	Yellow to gray
Kin Tiel Black-on-orange	1015	1244	Upper Le Roux	S	930°	12C9	39A1	Yellow to gray
Linden Corrugated	1005	2799	Silver Creek	S	930°	B511	40A4	Red to dark gray
Medicine Black-on-red	1799	2386	Deadman	S	930°	5E11	39C2	Red to gray
McDonald Corrugated	999	2824	Carrizo	S	930°	5D10	40H3	Red to black
Mimbres bold face Brown-on-cream	898	4748	Mimbres	S	860°	11A2	12A1	Cream to cold gray
Mimbres bold face Red-on-gray	898	4752	Mimbres	S	860°	13A2	14A1	Warm gray to cold gray
Rainbow Polychrome	1020	4204	Little Colorado, Petrified Forest	S	970°	4A11	Black	Pale orange to black
Showlow Black-on-red	1451	1296	Moencopi	S	930°	5E10	40H3	Red to black
Sikyatki Polychrome	1001	4745	Jeddito	S	970°	9D3	36A2	Yellow to gray
Sikyatki Polychrome	814	2773	Polacca	S	970°	9D3	36A2	Yellow to gray
Tonto Red	779	2952	East Verde	S	930°	5B9	40H3	Purple to black
Tusayan Black-on-red	2578	4746	Little Colorado, Leupp	S	970°	6H10	Black	Red to black
Wingate Black-on-red	933	1279	Lower Puerco	S	930°	5I10	39A2	Red to gray

stages of the investigation he heated the specimen by a blow pipe, and later he used the combustion tube. The method used was to heat all gray or white pottery types in an oxidizing atmosphere, and all yellow, red, or brown types in a reducing atmosphere. If the white or gray types turned yellow or red, then the conclusion was drawn that the original firing was in a reducing atmosphere. If on the other hand the yellow, red, or brown pottery turned white, gray, or black, then the conclusion was drawn that the original firing was done in an oxidizing atmosphere. This holds true with the exception of certain white clays or slips free or nearly free of iron. In general, firing methods can usually be inferred from the color of the pottery without any test whatever.

In the following tables, the pottery fragments before and after firing have been matched with the color standards in Maerz and Paul's *Dictionary of Color* (1930). The colors mentioned in the last column of the table have nothing to do with the *Dictionary of Color* but are approximations which indicate roughly, to persons unprovided with the *Dictionary*, the changes that occur.

The series of types makes no attempt to include all pottery types. It presents but a random sample picked from the 200 or more recognized pottery types of the Southwest.

TABLE V

HOPI CLAY FROM SICHOMOVI FIRED WITH DIFFERENT FUELS OUT OF DOORS TECHNIQUE MODELED ON HOPI METHODS

Fuel	Firing temperature	Surface color before firing	Surface color after firing	Color changes from	Remarks
Sheep dung	870°	12A1	10D7	Gray to orange	Pots protected by sherds
Juniper	700°	12A1	11B2	Gray to pale gray	Pots protected by sherds
Juniper	950°	12A1	10A1	Gray to white	No sherds
Corn cobs	685°	12A1	11B2	Gray to putty color	Pots protected by sherds

To gain further evidence, the author has tried to duplicate the conditions that a pueblo Indian in Northern Arizona might have used between 600 A.D. and 1300 A.D. in firing gray or white pottery. It is well known that gray and white pottery is found particularly in regions where junipers furnished the most important fuel supply. He, therefore, thought that a fairly big juniper fire might produce a reducing atmosphere, and it did.

He selected for the experiment a series of small jars of Hopi clay, made by a Sichomovi woman. The woman burned one in usual Hopi manner with sheep dung. It burned a beautiful orange at a temperature of 850° C. The author fired other bowls in juniper fires, one bowl at a temperature of 950° C. and another at 700° C., and one bowl in a corn-cob fire at 685° C. In both the corn-cob and the juniper fires the iron was reduced. In the case of the juniper fire, as the fire burns out the pots are covered with a bed of charcoal which probably provides the reducing atmosphere of carbon monoxide and also acts to keep out the air.

CONCLUSION

It is important to note: (1) that pottery fired in a reducing atmosphere occurs only in a small area in the states of Arizona, New Mexico, Colorado, and Utah; (2) that in northern Arizona the method was not used after 1300, but it continued to be used in New Mexico until about 1400; (3) that with one exception the basic technique can be determined by simple inspection of the color of the vessel—(a) if the pottery is white, gray, or dark gray it was fired in a reducing atmosphere, but (b) if the pottery is buff, yellow, red, or brown it was fired in an oxidizing atmosphere; (4) that pottery fired with a cedar wood at a temperature from 700 to 950° C. has the iron reduced. As juniper wood is found near the places where reducing atmospheres were used, it is possible that juniper was the fuel that produced the reducing atmosphere. A number of problems have presented themselves in the course of the tests which will be treated in another paper. These conclusions apply only to the Southwest culture area.

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FOLSOM AND YUMA CULTURE FINDS

HANS E. FISCHEL[207]

INTRODUCTION

A LITTLE more than a decade ago, the term "Folsom points" made its first appearance in the literature. It signifies a stone implement characterized by a wide, shallow groove, usually found on both sides (Figure 25: 1, 2, 6, 7). Previously these implements, known from surface finds only, had aroused no particular attention. Their true significance was established by the Colorado Museum of Natural History, when these artifacts were discovered in direct association with a number of extinct bison (*B. antiquus taylori*) and other animals. The undoubted association of fauna and artifacts was confirmed by Barnum Brown, A. V. Kidder, and F. H. H. Roberts, Jr. All finds of this particular grooved blade were henceforth called "Folsom" points, after the nearby town of Folsom, New Mexico.

At the Philadelphia conference in March, 1937, it was agreed to call all fluted points "Folsom," as suggested by Shetrone in 1936.[208] Consequently, the previously used terms "Folsom-like"[209] and "Folsomoid"[210] are omitted in the text of this paper. In the light of our present fragmentary knowledge, which does not permit of any clear-cut distinctions, the decision of the conference is logical. However, the possibility of variations in time and space should not be overlooked. The former basis of differentiation was purely typological, the cruder and more generalized forms being called "Folsom-like" or "Folsomoid." For the reader's benefit, this distinction has been retained in the attached tables (I and II), listing the occurrence of both types. In passing, it should be stated that by definition it becomes impossible to speak of ungrooved Folsom types,[211] or to make outline, rather than the groove, the primary criterion.[212]

Another type of excellently chipped blades, found most frequently in Yuma County, Colorado, in so-called "blow-outs" where the prairie soil had been blown away, likewise occurred in some instances together with extinct animals. Other implements of the same type and technical

[207] Department of Anthropology, University of California, Berkeley, California.

[208] Shetrone, 1936.

[209] Howard, 1935.

[210] Roberts, 1935.

[211] Schultz, 1936.

[212] Figgins, 1935a.

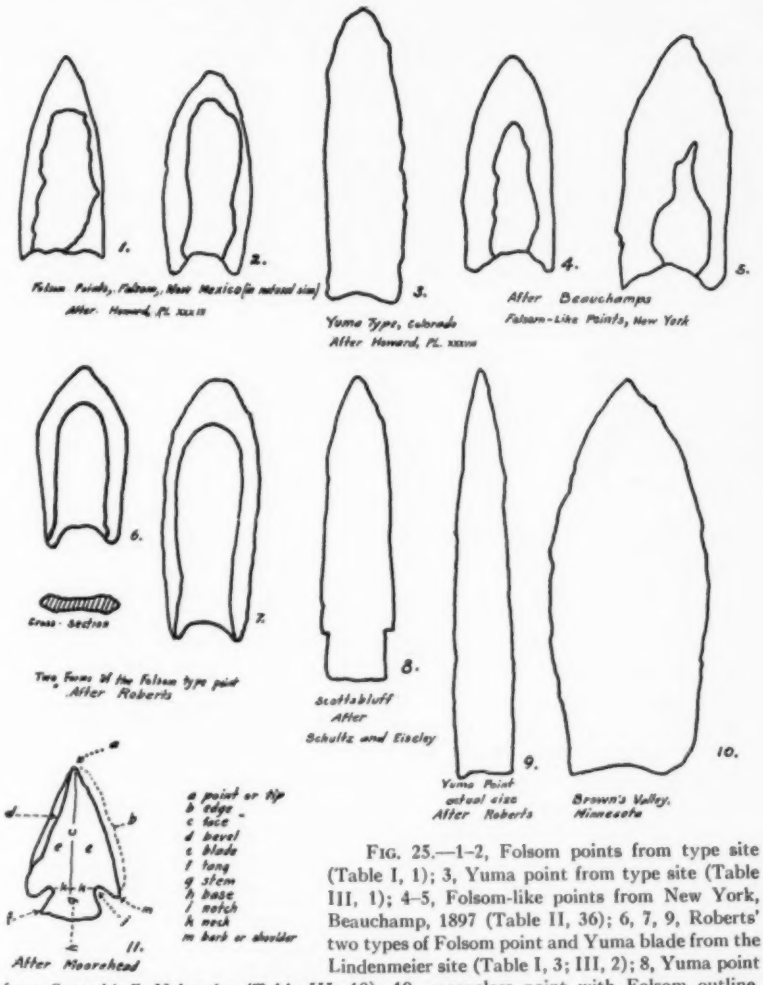

FIG. 25.—1–2, Folsom points from type site (Table I, 1); 3, Yuma point from type site (Table III, 1); 4–5, Folsom-like points from New York, Beauchamp, 1897 (Table II, 36); 6, 7, 9, Roberts' two types of Folsom point and Yuma blade from the Lindenmeier site (Table I, 3; III, 2); 8, Yuma point from Scottsbluff, Nebraska (Table III, 10); 10, grooveless point with Folsom outline, Brown's Valley, Minnesota, classified by Jenks as Yuma-Folsom point due to chipping technique; 11, schematic arrow-head and nomenclature for its various parts.

perfection were labelled "Yuma points" (Figure 25: 3, 8, 9). It is only fair to state that the stratigraphic evidence in regard to the Yuma points is less satisfactory. Their association with fossil fauna has been questioned, and in one instance[213] the claim has been advanced of an association with modern bison.

Numerous field reports have since been published dealing with both types of these artifacts. However, with rare exceptions[214] no comprehensive account has appeared. Therefore it seems appropriate now to take stock of the situation which concerns one of the most important problems in American archaeology. The following article attempts to give a composite picture of the Folsom and Yuma problem as it stands today. It supplies a description of the artifacts, their distribution and interrelationships. The immediate conclusions are amplified briefly by touching upon the geological, paleontological and anthropological aspects of the wider problem of Early Man in America.

FOLSOM POINTS

Folsom points resemble in some aspects, such as shape, technique, and highly polished surfaces, the Solutrean points of Europe, and to even greater extent, some points found in the Danish Neolithic. Their main distinction consists in a longitudinal groove, usually found on both sides, a unique feature found thus far only in North America.

Various reasons have been advanced to explain this groove. It served to thin the base, thereby facilitating hafting. It made for better penetration, breaking off of the tip and promoting bleeding. Although lightening the point, it also weakened it. As a result, most Folsom points are fragmentary, and more butts than tips are found, the latter presumably remaining in the hunted animals. The groove extends over from one-third to two-thirds of the blade and averages 13 mm. in width.

The material used in the manufacture of the Folsom points, as well as of the Yuma points, varies with the area where they are found.[215] Renaud[216] lists percentages for the various materials, according to which chalcedony is the material most frequently employed. Chert prevails in Wyoming, jasper in Nebraska, chalcedony in the East, obsidian in California, and true flint in Texas.[217] Shetrone[218] determined that the

[213] Figgins, 1934, 1935a.
[214] Howard, 1936; Shetrone, 1936.
[215] Barbour, Schultz, 1936a; Howard, 1934, 1935; Renaud, 1932a, 1937; Roberts 1936.
[216] Renaud, 1937
[217] Elrod, 1933.
[218] Shetrone, *ibid.*

Upper Mercer flint, used widely in more recent times in Ohio, was not used in the making of the Folsom and Yuma points. Investigations of this kind might lend themselves not only to determine the source of the material, but likewise the direction of the cultural flow.[219]

Folsom points are leaf-shaped and thin, with double-edged blades and a triangular or oval outline. The edges run almost parallel, tapering in the upper third of the blade. The blades are often as wide or wider than long, and broadest between the tip and the center of the blade.[220] Another variant is slenderer and longer, with a more tapering tip.[221] The Folsom points have neither stems nor notches. The groove produces a biconcave cross-section.

The base is usually deeply concave with ear-like lateral projections, resembling a fish-tail. This is caused by a rechipping of a seat ("nubbin") left at the base for removal of the flake which produces the groove.[222] The base, which is sometimes squarish or wavy, is usually narrower than the blade. Roberts[223] believes the squarish base (Renaud's type C 1) to represent a higher cultural level.

The dimensions of the Folsom points are given as follows:[224]

	Length	Width	Thickness
Range:	17–115 mm.	14–36 mm.	3–14 mm.
Average:	45–67 mm.	22–26 mm.	5–7 mm.

Folsom points were chipped by pressure with bone tools. Renaud[225] counted eleven flakes per two centimeters. The groove was made after the chipping, but before the marginal retouching, as proved by flakes which have been found.[226] Particularly in the eastern forms, the edges were usually smoothed to a straight line for a fourth or a half of the length of the blade, especially around the base or the posterior end.[227] At the Lindenmeier site a larger percentage remained unsmoothed.[228] Secondary chipping occurred between the edges and the central ridges caused by the groove.[229] In removing the flake, indirect percussion was

[219] McCown, 1935.
[220] Figgins, 1934; Roberts, 1935, 1936.
[221] Roberts, 1935.
[222] Roberts, *ibid.*
[223] *Ibid.*
[224] Howard, 1935; Renaud, 1931, 1937; Roberts, 1935.
[225] Renaud, *ibid.*
[226] Figgins, 1935a; Howard, 1934, 1935; Roberts, 1936.
[227] Shetrone, 1936; Sellards, 1938.
[228] Communication from Roberts, Nov., 1937.
[229] Howard, 1935; Roberts, 1935.

employed in addition to pressure, perhaps with hammer stones found with the Folsom complex at the Lindenmeier site.[230] The tradition of pressure flaking was also carried on by recent Plains hunters.[231]

Varying guesses have been made as to the probable use of the Folsom points. They have been called knife blades,[232] weapon points,[233] and projectile points.[234] In the latter case they were presumably used with the spear-thrower, although we have no evidence to this effect and the size of some of the specimens would admit of use with the bow.[235]

ASSOCIATED ARTIFACTS

It would be incorrect to speak of Folsom culture on the basis of the Folsom points alone. At Lindenmeier, Roberts[236] encountered other associated materials. These are listed and described in Table IV, together with the percentages indicating the numerical representation of the individual artifacts within the whole Folsom complex at this site. A similar complex, at least in part, seems to have existed in Morrill and Scottsbluff counties, Nebraska, Eddy County, New Mexico, Taylor County, Texas, and Lake County, California (cf. Table I: B, E, J, Q; Table II: 9, 19). No mortars were found and only one and one-half per cent of the artifacts were core-implements. The thumb-nail scrapers are not different from the ones found in recent sites, and similar bevel-edged tools have been encountered in Alaska, Alabama, Georgia, Ohio, Tennessee, and New Mexico. A surface survey in eastern Colorado and Wyoming[237] revealed percentages of eleven and ten for weapon points. These figures agree closely with that for the Lindenmeier site.

YUMA POINTS

Yuma points likewise resemble somewhat the Solutrean technique, especially as manifested in Cantabria.[238] Their fine marginal retouching corresponds also to that of Neolithic daggers from Denmark,[239] and Egyptian poniards.[240]

The Yuma points are leaf-shaped or lanceolate, elongated and slen-

[230] Renaud, 1931.
[231] Howard, 1935.
[232] BAE, 1934–35; Shetrone, 1936.
[233] Renaud, 1932b.
[234] Howard, 1935.
[235] Roberts, 1935, 1936.
[236] Roberts, 1935, 1936.
[237] Renaud, 1932, 1932a.
[238] Forde, 1930, p. 42, fig. 11.
[239] Renaud, 1931.
[240] Wilson, 1898, pl. 3.

der, with edges widest basally and parallel for two-thirds of their length but tapering towards the tip.[241] The tip itself is short. The cross-section of the blade is elliptical, diamond, or ovoid.[242] Usually the blades are unmodified (Figure 25: 3, 9); sometimes, however, they are stemmed or have one or two small shoulders near the base, forming a slight tang[243] (Figure 25: 8). Some of the Yuma points show central ridges.[244] The base is generally square, but sometimes concave or convex.[245] Renaud[246] divided the Yuma points into four major subtypes according to outline and base. All of these occur in Colorado; some of them, in Wyoming and Louisiana.

The dimensions of the Yuma points are as follows:[247]

	Length	Width	Thickness
Range:	29.5–150 mm.	12.5–43 mm.	3–9.5 mm.
Average:	62 mm.	22 mm.	7.2 mm.

The technique employed in making the Yuma points consisted of short, ribbon-like pressure flaking, directed parallel and obliquely upward. This resulted in thin, diagonal facets over the whole face of the blade, from side to side.[248] Renaud[249] counted five to seven flakes per two centimeters. Such ripple flaking was the final and very late step achieved in Denmark, Egypt, and apparently also by the Indians of southern California.[250] In the majority of Yuma points, the basal edges were ground smoothly.[251] The stems were thinned, presumably for facilitating hafting.[252] It is of interest to note that the Plains Indians retained this technique of flaking, in order to thin the base of their points. The so-called "buffalo points" from Austin, Texas, are a good example of this technique in more recent times.[253]

The Yuma points might have served either as projectile points[254] or

[241] Figgins, 1934.
[242] Howard, 1935; Roberts, 1936; Shetrone, 1936.
[243] Andrews, 1935; Howard, 1936; Roberts, 1936; Shetrone, 1936.
[244] Figgins, 1935a.
[245] Andrews, 1935; Figgins, 1935a; Howard, 1936; Roberts, 1936.
[246] Renaud, 1932b.
[247] Renaud, 1935, 1937.
[248] Figgins, 1934; Roberts, 1936.
[249] Renaud, 1931.
[250] Nelson, 1937.
[251] Figgins, 1935a; Howard, 1935; Shetrone, 1936.
[252] Roberts, 1936.
[253] Moorehead, 1931.
[254] Renaud, 1932b.

as knives, in the latter capacity possibly within the Folsom complex.[255]

DISTRIBUTION

Tables I-II and Figures 26, 27 show the distribution of the Folsom and Yuma points. Some sites, supposedly containing Folsom or Yuma artifacts, have been omitted purposely, partly due to unstandardized terminology and definition. Thus, although Schultz[256] speaks of an ungrooved Folsom type at Scottsbluff, Nebraska, the illustrations reveal conclusively only Yuma points. The Brown's Valley site in Minnesota,

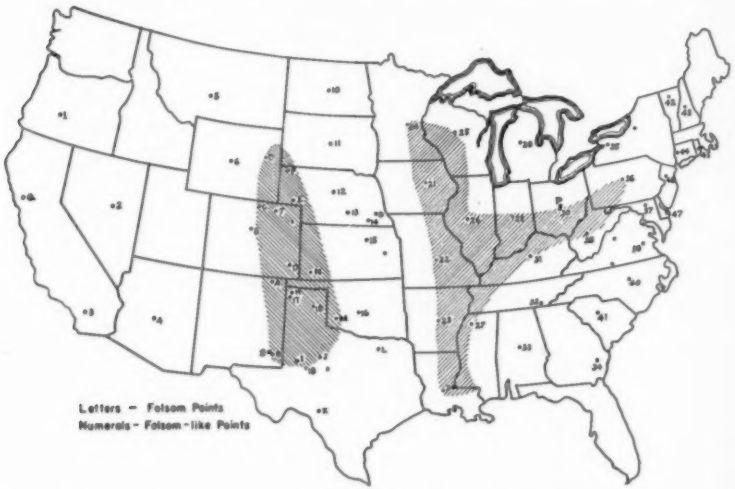

FIG. 26.—Areas of concentration for Folsom and Folsom-like points. The sites are plotted by letters and numbers according to tables I–III.

where Jenks[257] reported points midway in form between Folsom and Yuma types, was rejected by Roberts,[258] because the points do not conform to the Folsom type (Figure 25: 10). The point reported from Utah by Howard actually was found in Colorado, just south of the line, according to reliable information. However, this paper is not so

[255] Howard, 1935; Figgins, 1935a; Schultz, 1935.
[256] Schultz, 1936.
[257] Jenks, 1937.
[258] Roberts, 1935.

much concerned with any particular site, and on the whole no great change in the general distribution is involved.

From Figure 26, it appears that the Folsom points cluster in a belt stretching from north to south along the eastern edge of the Rocky Mountains. In the Southwest, Folsom points occur primarily near the headwaters of the larger river systems draining east or southeast, such as the Arkansas, Brazos, Canadian, Cimarron, Platte, Red, and White Rivers.[259] Folsom points have been found south as far as one hundred

FIG. 27.—Distribution of Yuma points. The sites have been plotted according to tables I–III.

and fifty miles southwest of Abilene, Texas.[260] Present evidence, according to J. A. Mason, seems to be against their occurrence in Mexico.

Variants of the Folsom points are found wide-spread over Canada and the United States, from California to the Atlantic seaboard, and from Canada to the Gulf of Mexico.[261] Although reported from every state in the Union with the exception of Washington, Idaho, Utah, Maine, Massachusetts and Florida, they have a particularly well marked distribution along the Mississippi and Ohio river drainages.

Yuma points seem to follow a somewhat similar pattern of distribu-

[259] Howard, 1936.

[260] Ray, 1935.

[261] Heizer, 1938 (Report on a Folsom Point from Sacramento Co., Masterkey, 5); Howard, 1936.

tion, with possibly a slight accentuation to the east. Schultz[262] observes that Folsom points are more frequently encountered in the foothills of the Cordillera, whereas Yuma points are found more often in the Plains area (Figure 27).

INTRA-RELATIONSHIPS

The matter of distribution leads logically to the question of intra-relationships between the artifacts. Obviously, it would be of greatest importance to establish the cultural and temporal relations between the various Folsom types. A close relationship would imply an early and country-wide occupation by Folsom Man. On the other hand, some variants might represent, conceivably, a much later and degenerate spread from an earlier center. Roberts [263] identifies the problem of typological development with the problem of diffusion. The latter could have proceeded southward along the Cordillera, then turned east and again northward. In this case the variants would be consecutive forms. Another possibility would explain the eastern and northern variants as offshoots of a common basic type.

On the grounds of distribution, materials,[264] dimensions,[265] and some technical features such as flaking,[266] the case for a close connection between Folsom and Yuma points seems rather strong. However, present evidence does not wholly justify the continued linkage between Folsom and Yuma points. The claim for a close relationship rests mainly upon a typological study of a surface collection made by Renaud.[267] Additional evidence used to establish the association of the two forms is based largely upon material from "blow-outs."[268] On typological grounds, Renaud[269] postulates Yuma points as preceding Folsom points, whereas Nelson[270] holds the Yuma type to be more advanced technologically. At any rate, on stratigraphic grounds, Folsom points seem to have antedated Yuma points.[271] Of the four Yuma points found originally at the Lindenmeier site, three occurred above the Folsom artifacts and only one with the latter. Thus, at best, only a later survival of the Yuma blades seems indicated at this site. In passing, it may be

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[262] Schultz, and Barbour, 1936a.
[263] Roberts, 1935.
[264] Shetrone, 1936.
[265] Shetrone, *ibid.*
[266] Nelson, 1937; Renaud, 1937.
[267] Renaud, 1931, 1932b.
[268] Schultz, 1935, 1936.
[269] Renaud, 1931; 1937, p. 81.
[270] Nelson, 1937.
[271] Roberts, 1935, 1936.

noted that Figgins[272] denies flatly any relationship between Folsom and Yuma points, and in contrast to Renaud proclaims the Yuma points as decidedly later than the Folsom points.

WHAT FOLSOM AND YUMA POINTS PROVE

As immediate and unquestionable conclusions we can state: 1. The Folsom points prove without any doubt that man was contemporary on this continent with extinct animals and animals now living in a different climate.[273] 2. Folsom Man was older than the oldest Basket Makers. This is borne out stratigraphically at Clovis, New Mexico, where Folsom points were discovered four feet below Basket Maker remains.[274] Besides this singular stratigraphic evidence, we can adduce that Basket Maker remains have not been found in association with extinct fauna, whereas Folsom points have never been encountered *in situ* with *Bison bison*, cultivated vegetables, or undisturbed modern remains.[275] Some of the latter occurrences in Nebraska, Ohio (Table I, P), and New York (Table II: 35) are easily explained by erosion or intrusion, modern Indians having picked up the artifacts and used them as charms.[276] 3. Folsom and Yuma points, when found authentically *in situ*, represent the oldest phase of aboriginal culture as yet definitely established for America,[277] excepting the recently discovered Borax Lake site in California, and possibly certain sites near Abilene, Texas. 4. Folsom and Yuma Man, however, possessed good pressure-flaking technique.[278] The chipping of the Folsom and Yuma points is far from primitive.

GEOLOGICAL CONSIDERATIONS

It remains now to present the problem in a wider context and in regard to its chronological aspects. Here we must briefly enter into some paleontological and geological considerations as they affect the archaeological material.

One of the main reasons for the assumption of Early Man in America is the association of artifacts with extinct fauna. This raises not only the question of the antiquity of man, but likewise of the time of disappearance of certain fauna.[279] Some Pleistocene animals might have

[272] Figgins, 1934, 1935a.
[273] Howard, 1935; Sellards, 1938.
[274] Howard, *ibid.*
[275] Figgins, 1934; Roberts, 1935, Schultz, 1935.
[276] Barbour, Schultz, 1936a.
[277] Barbour, Schultz, *ibid.*; Nelson, 1933; Roberts, 1934.
[278] Harrington, 1933.
[279] Anon., 1932.

survived the Ice Age proper, and a comparatively recent and rapid extinction might have taken place in post-glacial times.[280] However, whether this applies to all the extinct species of bison which have been encountered with human remains in North America, seems questionable. Besides the bison, the camel,[281] the ground-sloth,[282] the mastodon,[283] and the mammoth[284] seem to have existed contemporaneously with man in North and South America. The latter two species are unfortunately used interchangeably in anthropological literature. In most cases we probably deal with remains of the mammoth. The traditions of flood sagas and of the mammoth would be congruous with the floods at the end of the glacial age and the consequent extinction of species.[285]

The paleontologist has utilized phyla, especially Pleistocene and the later vertebrates, as a criterion for dating and as a basis of differentiation between the Pleistocene and the Recent.[286] However, extinct animals seem chronologically to be an insufficient criterion.[287] Whereas the change from Pliocene to the Pleistocene consisted in an evolution within groups,[288] the transition from Pleistocene to Recent was more a matter of extinction than of morphological change or the origin of species.[289] Invertebrates remained mostly unchanged from the Pleistocene to the Recent.[290] Many vertebrates have changed very little, and nearly all of the existing mammals are survivals from the Pleistocene.[291] On the whole, small fauna survived better than the larger.[292] The essential difference between Pleistocene and Recent fauna is, therefore, rather one of quantity than of kind.

[280] Bell, Van Royen, 1934.

[281] Hay, 1928; Romer, 1928.

[282] Harrington, 1933; Romer, 1933; Bird, Science 86, 1937.

[283] Uhle, 1928.

[284] Putnam, 1888; others.

[285] Wright, 1890. There are manyfold indications for a very late survival of the mammoth into recent times. Traditions of the mammoth are found with the Dakota and the Delaware (Winchell, 1907). The Algonkins kept true historical traditions of the mammoth (Strong, 1934). Elephant stone pipes from Iowa, the Elephant mound, and the Lenape stone (Mercer, 1885) might serve as corroborative evidence, although the pictorial evidence alone might be considered insufficient to establish either Early Man or the survival of fauna.

[286] Figgins, 1934.

[287] Howard, 1936.

[288] Cook, 1925.

[289] Cooke, 1928; Hay, 1918; Romer, 1933.

[290] Wissler, 1935.

[291] Cooke, 1928.

[292] Romer, 1933.

Some plants and animals possess a wide climatic range and adaptability.[293] This, as well as the geographical factor, or rather its neglect causes much of the dispute among paleontologists,[294] and prevents any uniform dating for the extinction of certain species in the various parts of America. Consequently, paleontologists have come to recognize the fact that biologic forms do not correlate uniformly with abstract time.[295]

Obviously, the geologist must determine the chronological position of deposits containing archaeological material. The geological classification of the Pleistocene is still in doubt,[296] due to the difficulty of determining the borderline between the Pleistocene and Recent.[297] In a way, Greenland and the higher mountain tops can be considered to be still in the glacial age.[298] On the other hand, Alaska has never been completely glaciated since the Mesozoic, except for the mountainous areas.[298] Furthermore, any chronological fixation of the Pleistocene would have to assume different dates for various areas in America. The extent of the Wisconsin glaciation was greatest about 30,000 years ago, but Ontario was affected as recently as 9,000–15,000 years ago. The Cordillera glaciers disappeared earlier than the Laurentide ice sheet in the northeast.[299] Therefore, the term "Pleistocene" is subject to qualification,[300] and it has been suggested that terms such as "varves" and "cycles" be used rather than the meaningless "Pleistocene."[301]

The geological evidence for man's presence in America either during the retreat of the ice or incidental to it, is steadily accumulating.[302] It seems quite plausible that the changing climate, and concomitant migration and partial extinction of fauna, induced man to migrate to the New World. Regardless of whether there was a land bridge between Asia and Alaska in Pleistocene or post-glacial times, an ice-free passage existed during the latter half of the Wisconsin from central Asia across Bering Straits, via St. Lawrence Island, up the Yukon Valley, across into the Mackenzie watershed, and down the eastern edge of the Rocky Mountains.[303] The distribution of the Folsom and Yuman points would

[293] Johnston, 1933.

[294] Cope, 1895; Hay, 1918, 1928; Loomis, 1926 vs. Antevs, 1935a; Jones, 1925; Judd, 1929; Romer, 1933.

[295] Nelson, 1933.

[296] Bell, Van Royen, 1934.

[297] Harrington, 1933.

[298] Bell, Van Royen, 1934.

[299] Johnston, 1933.

[300] Bell, Van Royen, *ibid.*

[301] Conkling, 1932.

[302] Schultz, 1932.

[303] Hrdlička, 1918; de Laguna, 1936; Shetrone, 1936.

be in agreement with an early infiltration along this route, without constituting positive proof that this route actually was taken by the first immigrants.

It is to be hoped that auxiliary sciences, such as climatology, based upon faunal[304] and floral[305] evidence, will furnish us with a better knowledge of glacial and post-glacial estimates.[306] At any rate, the problem of geological age should be entirely divorced from a determination by cultural typology.[307]

ARCHAEOLOGICAL CONSIDERATIONS

Let us return from the more general considerations of the problem of man's antiquity in America to the Folsom-Yuma problem. No true Folsom points have ever been reported from Asia or any other continent except for North America.[308] If true Folsom points cannot be found in Asia, obviously man must have entered the New World with other types of artifacts. Therefore, failure to find Folsom or Yuma types in Asia necessarily implies a pre-Folsom culture in America. Furthermore, the artful flaking and the fine chipping of the artifacts, presupposing a thorough knowledge of the materials and great technical skill, tends to support this theory.

In this regard, the Borax Lake site (Table I, Q) seems to be the factual corroboration of a hypothetical premise. There it appears, on stratigraphical grounds, that the Silver Lake and Borax Lake types preceded the Folsom types. The Silver Lake type has been described by Campbell (1935) for the Pinto site. The Borax Lake type is described by Harrington (1938) as narrow-stemmed and wide-shouldered. These points were found to a depth of five feet, underlying the Folsom points found only near to the surface. Technically, they are far inferior to the workmanship shown in the Folsom specimen. In regard to the Borax Lake type, the writer likes to point out the Brazos River Branch in North Central Texas, described by Sayles (1935), where projectile points have been found in combination with Folsom points under conditions strik-

[304] Antevs, 1935a.

[305] Sears, 1932.

[306] Howard, 1935.

[307] Bell, Van Royen, 1934.

[308] Jenks (1937), quoting the National Geologic Survey of China and the Imperial University of Tokyo, states that slate points with rubbed grooves are known from the Pre-Han period in Manchuria, and also from more recent strata in Alaska. Their technique, however, is very different from the one employed in making the Folsom points (Howard, 1935). Jochelson mentions triangular points with a somewhat grooved base from dune areas and river terraces in Siberia. Petri (1915) depicts points resembling the Yuma type.

ingly similar to those at the Borax Lake site. The points themselves, depicted on Plate XI, A, c, d, and described on tables 4 and 9, resemble the Borax Lake type. In the same category may belong the so-called Clearfork Type, found near Henrietta, Texas, and described by Ray (1935), who claims that this stemmed point preceded the Folsom points at this site. Below the Borax Lake type, Harrington believes he discerns an even earlier horizon, represented by a large and coarse type of scraper, thereby opening a vista of possibly several pre-Folsom cultures. Although this discovery is highly significant, the seemingly isolated occurrence of Folsom points at present, must yet be explained. Conceivably some of the "non-Folsom" finds in America, reported to be early, might have preceded the Folsom-Yuma complex. However, these paleolithic-like[309] implements were not found *in situ* or in deposits where antiquity can be demonstrated.[310] Holmes[311] disclaims the age of so-called paleolithic artifacts in America. Objects should not be employed in determining geological sequences.[312] Furthermore, there is no direct evidence of paleolithic-like forms in America bearing the same implications as the ones found in Europe, and therefore no sound inference can be drawn from these artifacts in regard to American chronology. It is not permissible to assume that certain types of implements had a universal distribution during a certain geological age.[313] They might be merely proof that in the elementary stages of tool-making, the Indian chanced upon the same processes as paleolithic man in Europe.[314] In this respect the controversies between paleontologists and anthropologists are equally unsatisfactory. Taken by themselves they sound convincing enough, but, because neither extinct species nor modern skeletal or cultural remains lend themselves to a proper chronological determination, the arguments lead precisely nowhere.

Folsom Man himself is at present still *persona incognita*,[315] in spite of Robert's most diligent search for skeletal remains at the Lindenmeier site.[316] Presumably, man's drifting into the New World in small groups accounts for our finding numerous instances of artifacts with fossil fauna without having encountered Folsom Man himself. In order to

[309] Term proposed by Roberts, Letter, November, 1937.
[310] Moorehead, 1931.
[311] Holmes, 1904.
[312] Obermaier, as quoted by Lowie, 1931.
[313] Boas, 1933.
[314] Nelson, 1917.
[315] Howard, 1935.
[316] Roberts, 1935, 1936.

reconcile the assumption of man's arrival in America, as late as at the end of the Pleistocene, with the diversity in physique, language, and cultures which is found in America, one has arbitrarily to think of man's coming in different waves of varying composition.[317] It is generally assumed that Folsom Man will be proved to belong to that dolichocephalic (sometimes called "pseudo-Australoid") type which seems to have preceded the brachycephalic type in America.[318]

In order to counteract exaggerated claims for antiquity, anthropologists often have been guilty of too extreme conservatism, and, conversely, their claims for recency frequently were made without proper regard for the evidence.[319] Evolutionists contended that only modern types of man have been encountered in America.[320] However, lack of anthropoid or physically archaic features does not necessarily imply a recent date. *Homo sapiens* was in the Old World before the end of the glacial age, and possibly his age has been minimized.[321] Frequently, intrusion was blamed for any association suggesting antiquity. Roberts[322] therefore paid special attention to the occurrence of animal burrows at the Lindenmeier site. Their effect could be established in only one instance out of 750 implement finds.

Unwittingly, Harrington[323] admits the fallacy of the reasoning which was in vogue until recently, by stating: "In the light of the recent discoveries many of the earlier finds ring true." As far as these earlier finds were typologically not of the Folsom or Yuma type, they can not be affected by the recent discoveries. Furthermore, doubtful stratigraphy does not become better evidence due to recent finds. If, however, by any chance a preconceived idea could not have admitted of modern types of artifacts or man under the particular circumstances, then indeed the argument looks considerably weaker in the face of undoubted association of artifacts with extinct fauna. In this case, however, the argument was ill-founded in the first place.

[317] Boas, 1933.

[318] Hooton, 1933. This type has been found in Punin, Ecuador; Lagoa Santa, Brazil; Pericue, Lower California (Hooton, 1933); the Gulf Coast and Abilene section, Texas (Cook, 1931a); Vero, Florida; Brown's Valley, Minn. (Jenks, 1937); Bransom, Col. (Figgins, 1935: Homo Novusmundus); Conkling Cavern, N. M. (Conkling, 1932); Lansing, Kansas; Rockbluff, Ill.; the eastern Algonkin area; Point Barrows, Seward Peninsula; and possibly in a strain of the Basket Makers.

[319] Roberts, 1935.

[320] Howard, 1936.

[321] Barbour, Schultz, 1936a; also Leakey.

[322] Roberts, 1935.

[323] Harrington, 1933.

We have endeavored to show that neither the association with fossil fauna nor cultural typology is a reliable index of time, and that only the geological position of stratified deposits would be a dependable index of age. Unfortunately, in most instances the geological problem has not been solved satisfactorily, particularly in terms of absolute age.

Although it has been definitely established that the Folsom-Yuma complex is older than the Basket Maker remains, it remains to be seen whether it immediately preceded them. Apparently, geologically as well as culturally, a gap existed between the Folsom complex and the Basket Maker. In Gypsum cave,[324] a sterile stratum occurred between the sloth layer and Basket Maker remains on top. The sloth layer itself has not been identified with the Folsom complex, but the former seems to be related more closely to the Basket Makers than the latter. The lowest level at Signal Butte, Nebraska,[325] resembles typologically the Folsom complex, yet seems to be younger, especially as no extinct species was encountered. Therefore, the implications are that the Folsom-Yuma complex did not directly precede the Basket Makers, and a number of cultures eventually may come to light, intermediate in time between the Folsom-Yuma complex and the earlier known cultures.

The recent discoveries make it more and more difficult to ignore the increasing and concordant testimony for Early Man in America. Human remains in association with fossil fauna in Pleistocene deposits in Nevada; Dent, Colorado; New Mexico; and Colorado City, Texas,[326] are evidence for Early Man in the Southwest during the Late Pleistocene,[327] or during the transition from the pluvial to the post-pluvial period.[328] Man's existence in the Southwest is estimated to have begun 15,000 to 20,000 years ago, during the pluvial period. Prior to that, the ice would have blocked man's passage.[329] The age of the Lindenmeier site in Colorado is assumed to be 13,000 years.[330] In 1933, Nelson[331] had considered the Folsom-Yuma artifacts to be essentially post-glacial, although in technique they faintly suggest Solutrean forms. In reviewing Robert's second report on the Lindenmeier site, Nelson[332] now dis-

[324] Harrington, *ibid.*
[325] Strong, 1933.
[326] Bryan, 1931.
[327] Johnston, 1933.
[328] Howard, 1936.
[329] Antevs, 1935a.
[330] Roberts, 1936.
[331] Nelson, 1933.
[332] Nelson, 1937.

putes the proposed age of 12,000 to 13,000 years. Even granting that Folsom and Yuma points should represent a Solutrean radiation, this age could only be upheld if one believes in the slender possibility of a north Asiatic origin for the Solutrean.[333] At present, however, Nelson holds the Folsom and Yuma artifacts to be of neolithic and more recent provenience. He seems to have arrived at this conclusion primarily because the implements associated with the Folsom points do not impress him as very old typologically. In this connection it should be pointed out that Holmes had applied effectively the principle, fundamentally sound, of keeping chronological and typological considerations apart, in order to disclaim hoary antiquity for the so-called paleoliths in America. By the same token, this principle should likewise be adopted to disprove claims for recency based primarily upon typological grounds, regardless of whether Nelson's judgment might be eventually substantiated.

In the southern Plains, east of the Rocky Mountains, man also seems to have existed at the end of the Pleistocene, or immediately thereafter.[334] In Nebraska, the Folsom and Yuma artifact makers are the representatives of the oldest cultural complex established there as yet.[335]

Man seems to have occupied a portion of eastern North America at a time when the northern part of the United States probably was still covered with ice.[336] Frequent occurrences of cultural associations with the mammoth, and the finding of Folsom-like points should be mentioned in this connection.

CONCLUSION

The Folsom-Yuma complex seems to be representative of an early and apparently widespread hunting pattern. Compared to the earliest cultures discovered in Mexico, Folsom and Yuma finds impress one as a paleolithic-like complex of only modest range,[337] rather than a complex archaic culture.[338] Concerning its age and physical type, Howard[339] concludes as follows: "The Palaeo-Americans were morphologically not radically different from modern Indians, nor so recent as to make the

[333] Peake and Fleure (1927) suggested this, in which case certain impulses could have reached America even earlier than Europe.

[334] de Laguna, 1936.

[335] Schultz, 1936a.

[336] Putnam, 1888.

[337] Lowie, 1935.

[338] Shetrone, 1936.

[339] Howard, 1936.

extinction of the Pleistocene fauna geologically and paleontologically unacceptable. Man seems to have been here about 8,000 B. C., in order to satisfy the geological, paleontological and archaeological requirements."

The Folsom and Yuma discoveries supply us with well authenticated and concrete material in the search to unravel American prehistory. Therein lies their main importance. The alignment of this complex with cultures known already, the further definition of the Folsom and Yuma cultures themselves, their extent in space and time, their origin and antecedents, Folsom-Yuma man's physical characteristics and route, are some of the most important problems in American archaeology. To further this cause, the "Committee on the Study of Early Man in North America" was formed under the auspices of the Carnegie Institution of Washington.[340] SCIENCE SERVICE likewise has undertaken to investigate all reported finds of Early Man in the United States.[341]

EXPLANATIONS TO TABLES AND ANNOTATIONS

Tables I–III list finds of Folsom, Folsom-like and Yuma points alphabetically or numerically by sites, with the faunal remains and the circumstances under which they were encountered. The numbers listed under the caption "Reference" refer to the titles in the bibliography. Some of the figures quoted with the reference numbers apply to illustrations accompanying this paper on Figure 25.

Inasmuch as some authors have used various definitions for the artifacts in question, certain difficulties were encountered in drawing up the tables and figures. Some of these are discussed in the paragraph dealing with the distribution of the artifacts. It should be added here that the technique employed in the making of the Yuma points, and their refinement, is less easily apparent from illustrations and descriptions in the literature than the characteristic groove of the Folsom and Folsom-like points. Consequently, some doubt might arise regarding the locations listed under Nos. 8, 24, 32, and 34 of Table III.

Table IV is self-explanatory and has been mentioned briefly on p. 237.

Whereas the tables present the factual reports, the annotations represent interpretations and appraisals gleaned from the literature. These frequently show widely divergent opinions concerning the age, true or accidental associations, and other features.

[340] de Terra, 1934.
[341] Nelson, 1933.

TABLE I

DISTRIBUTION OF FOLSOM POINTS

No.	Site	State	Artifacts	Fauna	Situation	Reference
A	Folsom, Union Co.	N.M.	19 Folsom points. Only one complete. Burned bones. No Yuma points.	40–50 *Bison taylori*, musk-ox, horse, camel, antelope.	7–12′ deep.	14, 26, 27; 18, 58, 97, 116. Figure 25: 1, 2.
B	Burnet Cave, 50 mi. N.E. of Carlsbad, Eddy Co.	N.M.	Folsom points, also with dorsal ridge. Burned bones, charcoal.	*Bison alleni*, musk-ox, camel, antelope, horse, mastodon, cave-bear.	4′ under Basket Maker remains. Before all of clay was deposited.	57, 58; 6, 53, 54, 78.
B1	Clovis, Eddy Co.	N.M.	Folsom points, side scrapers, gravers.	Extinct bison, mammoth, mollusks.	Gravel pits in old lake basin. In 6′ blue clay under several feet of red-brown sand.	7, 57, 58; 6, 56.
C	Lindenmeier, 28 mi. N. of Ft. Collins, Larimer Co.	Col.	83 points, found by Coffin. 750 artifacts by Roberts; 19 Folsom points, knives, scrapers, drills, gravers, choppers, hammerstones, incised bone disk, hearths.	9 *Bison taylori*, fox, rabbit, wolf, pronghorn, mollusks, Mammoth.	Under 16′ sterile deposits at bottom of shallow pond. Trench and bison pit dug. Campsite and workshop. No geological horizon established as yet.	103, 104, 105; 19, 57, 58, 116, 120. Figure 25: 6, 7.
D	Prowers Co.	Col.	Folsom point.			57.
E	Bridgeport, near Dalton Morrill Co.	Neb.	2 Folsom points, snub-nosed scrapers.		16′ deep, firmly embedded.	98.
F	Dawes Co.	Neb.	Folsom point.			98.
G	Lancaster Co.	Neb.	1 Folsom point.			98.
H	Dallam Co.	Tex.	Folsom point.	Extinct fauna.		58.
I	35 mi. S.W. of Colorado City, Mitchell Co	Tex.	Folsom point.			91, pls. 12: 5, 14: 7.
J	Around Abilene, Taylor Co.	Tex.	15 Folsom points, deeply recessed base, patinated. Snub-nosed scrapers, flakes, petrified and carved bones, shells. Also triangular thin retouched points.		Campsites in gravel exposed on surface.	92, 91, pl. 10: 6–11; 57, 97, 116.

TABLE I—*Continued*

No.	Site	State	Artifacts	Fauna	Situation	Reference
K	Uvalde, Uvalde Co.	Tex.	Folsom point.			57, 116.
L	Henrietta, Clay Co.	Tex.	2 Folsom points.		Campsites in terrace deposits.	93, pl. 9: 83–85; 16, 128.
M	Western	Okla.	Folsom point.			57.
N	Southwestern	Kan.	Folsom point.			57, 116.
O	Niobarra Co.	Wyo.	Folsom point.			57, 97.
P	(State Museum.)	Ohio	140 Folsom points.		From surface; 2 points, intrusive in Esch Mound.	116.
Q	Borax Lake; 1 mi. N. of Manakee Lake Co.	Calif.	12 Folsom points. Mohave and Borax points below, also 250 scrapers, choppers, gravers, flakes.		From surface to 1′ in black ashy soil on yellow clay 8–10′ deep, containing other artifacts.	46.

TABLE II

DISTRIBUTION OF FOLSOM-LIKE POINTS

No.	Site	State	Artifacts	Fauna	Situation	Reference
1		Ore.	Folsom-like point.			57.
2		Nev.	Folsom-like point.			57.
3	Pinto Basin, S. Bernardino Co.	Calif.	Crudely flaked grooved points.		In 2nd horizon of 4 pre-pottery horizons.	20; 27, 47, 57.
4		Ariz.	Folsom-like point.			57.
5		Mont.	Folsom-like point.			57.
6		Wyo.	Folsom-like point.			57.
7	Yuma Co.	Colo.	Folsom-like points. Tool flakes from bison bones.	Mastodon (cut bones).	Blow-outs. Grayish bed above gravels deposited during wet cycle.	5, 39, 97, 100.
8	Dent, Weld Co.	Colo.	Folsom-like points.	Mammoth.	5–7′ deep.	36, 57, 58.
9	Burnet Cave, Eddy Co.	N.M.	Folsom-like points. Burned bones, etc.	*Bison alleni*, musk-ox, camel, antelope, horse, mastodon, cave bear.	Old lake basin, gravel pit in 6′ blue clay under several feet of sand.	57, 58; 6, 53, 54, 78.

TABLE II—*Continued*

No.	Site	State	Artifacts	Fauna	Situation	Reference
10		N.D.	Folsom-like point.			57.
11		S.D.	Folsom-like point.			57.
12	Cumro, Custer Co.	Neb.	76×17×5 mm., 1 groove.	*Bison occidentalis.*	14–16′ yellow loess.	57, 109.
13	Nuckolls Co.	Neb.	Blunt tip, crude chipping.	Mastodon.	16′ deep in dry channel bed.	22, 35, 43.
14	Grand Island, Hall Co.	Neb.	47×30×5 mm., 1 groove, gray flint.	Fossil bison, hackberry seeds.	4–17′ clay silt.	79, 9.
15	Wabaunsee Co., Riley Co.	Kan.	Folsom-like points.			80, p. 76, fig. 92.
16		Okla.	Folsom-like point.		From surface.	97.
17	Dallam Co.	Tex.	Folsom-like point.	Extinct fauna.	In situ.	16: 24, 2.
18	Miami, Roberts County.	Tex.	114 mm., partial groove, smoothed edges.	Mammoth 18″ away.	Lake bed, blue-green clay.	4, 58, 130.
19	Abilene, Taylor County.	Tex.	Elongated, triangular square base, groove ¼ way up, then curving toward edge.	Mammoth.	Gravel terrace. In red soil carried by water.	90, pp. 8–9 lower panel, p. 19.
20	Forest Lake, Anoka Co.	Minn.	80×33×6 mm., concave base, smooth edges, broadest near middle.	Mammoth.	Pluvial gravel.	62.
21		Iowa	Folsom-like point.		From surface.	113.
22		Mo.	Folsom-like point.			41.
23		Ark.	Folsom-like point.			57.
24		La.	Folsom-like point.			57.
25		Wis.	Folsom-like point.			68, 69, pl. 11, 2.
26		Ill.	Folsom-like point.			57.
27	Tate Co.	Miss.	Folsom-like point, blunt edge.			15, p. 130, fig. 28, last in 4th, 2nd in fifth row.
28		Mich.	Folsom-like point.			57, fig. 188.

TABLE II—*Continued*

No.	Site	State	Artifacts	Fauna	Situation	Reference
29		Ind.	Folsom-like point.			57.
30		Ohio	Folsom-like point.		From surface.	57.
31	Woodford Co.	Ky.	Folsom-like point.			80, p. 171, fig. 253; 3.
32	Blount Co.	Tenn.	Folsom-like point.			41, 57.
33		Ala.	Folsom-like point.			57.
34	Savannah Valley.	Ga.	Folsom-like point.			80, p. 386, fig. 581.
35	3 mi. S.E. of Baldwinsville, S.E. of Oneida & Cross Lakes Onondaga Co.	N.Y.	64×51×3 mm.; 124×51; 95×41 mm.; lustrous bluish gray.		From double-walled earthwork (Iroquoian).	11, figs. 13, 14; 57, 55. Figure 25: 4, 5.
36		Pa.	Folsom-like point.		From surface.	57.
37		Md.	Folsom-like point.			57.
38		W.Va.	Folsom-like point.			57.
39	Green, Halifax, King Counties.	Va.	Folsom-like points.		From surface of eroded hill-tops.	19, 57.
40		N.C.	Folsom-like point.			57.
41		S.C.	Folsom-like point.			57.
42		Vt.	Folsom-like point.			57.
43		N.H.	Folsom-like point.		In situ.	57.
44		Conn.	Folsom-like point.			80, p. 122, fig. 58.
45		R.I.	Folsom-like point.			57.
46	Newark, Essex Co.	N.J.	Folsom-like point.			81, p. 65, fig. 51, p. 89, fig. 71.
47		Del.	Folsom-like point.			57.
Q	Borax Lake, 1 mi. N. of Manakee, Lake Co.	Calif.	4 Folsom-like points, 250 other artifacts. Cf. Folsom Points.		From surface to 1′ in black ashy soil (eroded?).	46.

TABLE III

DISTRIBUTION OF YUMA POINTS

No.	Site	State	Artifacts	Fauna	Situation	Reference
1	Yuma Co.	Colo.	Yuma points, tool-flakes, bison bones.	Cut bones of mastodon.	Blow-outs; grayish bed above gravels, deposited during wet cycle.	5, 39, 100, 97. Figure 25: 3.
2	Lindenmeier, N. of Ft. Collins, Larimer Co.	Colo.	4 Yuma points and Folsom complex.	Pronghorn, *Bison taylori*, mollusks.	Under 15′ sterile soil, 12′ above gully bed. (Cf. Folsom).	103, 105; 57, 58, 116. Figure 25: 3, 9.
3	Douglas Co.	Colo.	Yuma point.			39.
4	Cheyenne Co.	Colo.	Yuma point.			39.
5	Clovis, Eddy Co.	N.M.	Yuma knives and associated Folsom artifacts.	Mammoth, extinct bison, mollusks.	Gravel pits in 6′ blue clay under several feet of red-brown sand.	7, 57, 58; 6, 56, 78.
6	Niobara Co.	Wyo.	28 Yuma points.			57, 97.
7		Nev.	Yuma points.			47.
8	St. Barbara Co.	Calif.	Leafshaped spearheads without stems and notches, 114×31 mm.			47, 74, 102, pl. 60, p. 357, pl. 75, p. 403.
9	Agate Springs, Sioux Co.	Neb.	Yuma points, bones, charcoal pits.		Lake bed 25′ below surface.	112, 113, 34.
10	Scottsbluff Co.	Neb.	9 notched, slightly tanged Yuma points, snub-nosed scrapers, charcoal, etc., below.	30 articulated *bison antiquus taylori*, also *bison septentrionalis*.	Undisturbed gravel beds under 12–27′ of windblown material.	10, 113, 12, 110, 111, 112, 98, 97. Figure 25: 8.
11	Bridgeport, near Dalton, Morrill Co.	Neb.	49 Yuma points, snub-nosed scrapers.		16′deep, firmly embedded, deposited in dry period.	12, 98.
12	Sheridan Co.	Neb.	5 Yuma points.		Pleistocene lake bed.	98.
13	Garden Co.	Neb.	21 Yuma points.		Pleistocene lake bed.	98.
14	Hooker Co.	Neb.	2 Yuma points.		Pleistocene lake bed.	98.
15	Logan Co.	Neb.	1 Yuma point.		Pleistocene lake bed.	98.
16	Lincoln Co.	Neb.	1 Yuma point.		Pleistocene lake bed.	98.

TABLE III—*Continued*

No.	Site	State	Artefacts	Fauna	Situation	[Reference
17	Champion, Chase Co.	Neb.	6 Yuma points.			98, 3, 64.
18	Holt Co.	Neb.	1 Yuma point.		Pleistocene lake bed.	113, 98, 97.
19	Grand Island, Hall Co.	Neb.	53×19×5mm., no notches.	Extinct bison, Hackberry seeds.	In 4–17′ clay silt on Kansan gravel.	79, 9.
20	Frederick, Tillman Co.	Okla.	Yuma points, metates, manos, modern point. 114×31 mm.	Musk-ox, bison, *stegomastodon*, *mammoth columbi*, ground sloth.	In 2′ of hard conglomerate, 7′ under faunal remains.	42, 50, 73, 119; 2, 24, 34, 25, 57, 72, 107, 118.
21	Dallam Co.	Tex.	Yuma point.	Extinct fauna.		57.
22	Lone Wolf Creek, Mitchell Co.	Tex.	3 Yuma points.	Fossil bison vertebra and femur.	5–7′ hard, undisturbed gravel (Pleistocene?).	23.
23	Henrietta, Clay Co.	Tex.	3 Yuma points.		Camp sites in terrace deposits.	93, pl. 9: 83–85; 16, 128.
24	Forest Lake, Anoka Co.	Minn.	Yuma point.	Mammoth.		62.
25		Mo.	Yuma point.			97.
26		La.	15 Yuma points.			97.
27		Ill.	8 Yuma points.			81, p. 72, fig. 57.
28		Ohio	1 Yuma point.			116, 39.
29		Ky.	1 Yuma point.			97.
30	McMinn Co.	Tenn.	Yuma point.			41, fig. 195.
31	Woodcrest, Oneida Co.	N.Y.	Yuma point.			11, fig. 68.
32	Allentown, Lehigh Co.	Pa.	Yuma point.			81, p. 59, fig. 47.
33		N.C.	Yuma point.			33.
34	Sebago, Cumberland Co.	Me.	Yuma point.			81, p. 73, Figure 58.

ANNOTATIONS TO TABLES I–III

Table	No.	Site	State	Remarks
I	A	Folsom	N.M.	Found by Howarth and Schwachheim from Raton, N.M. in 1926. Kidder, Roberts and Barnum Brown (1929) confirmed the true association and believe the site to date from the close of the Pleistocene. Kirk Bryan holds the site to be Late Pleistocene or Early Recent. Nelson (1937) calls it culturally a full-fledged Neolithic. Sayles (1935) ranks the site with his earliest post-glacial hunting period.
I II	B 9	Burnet Cave	N.M.	Howard (1935) estimates age at 10,500 years.
I III	B1 5	Clovis	N.M.	The fauna indicates a moister and cooler climate here, 11,000–15,000 years ago. (Anonymous 1936.) According to Sir Woodward (Wissler, 1936) a transition between Late Pleistocene and the Recent. Antevs (1935) assumes an age of 12,000–13,000 years. Figgins rejects any evidence for antiquity.
I III	C 2	Lindenmeier	Colo.	Mollusks found point to a moister and warmer climate here. (Roberts, 1934.)
I III	E 11	Morrill Co.	Neb.	Soil built up in dry periods and eroded in moist ones, a process of thousands of years. (Bell, Van Royen, 1934.)
I III	I 22	Colorado City	Tex.	Sayles (1935) includes this site with his earliest post-glacial hunting period.
I II	J 19	Abilene	Tex.	Points not found *in situ*. Geological evidence strongly favorable that man lived here during the Late Pleistocene (Leighton and Sayles, 1936). According to Shuler (1934) immediately post-glacial. Antevs believes in high antiquity of this site. Ray (1932) believes Folsom points were made here until a few hundred years ago. Sayles (1935) lists twenty-two sites with Folsom and Yuma points along the Brazos River with Brazos River types on top. Although the Folsom and Yuma types have a wider range, the similar distribution does not seem accidental. The earliest phase of the Brazos River types (west of Abilene) was either contemporary or Post-Folsom.
I III	L 23	Henrietta	Tex.	Ray (1935) believes the so-called "Clearfork Type" with ungrooved, even-stemmed points was made before the Folsom type at this site.
I II III	P 30 28		Ohio	Dimensions and material similar to Folsom and Yuma points found in Colorado and New Mexico according to Shetrone (1936).
I II	Q Q	Borax Lake	Calif.	Found by Chester C. Post from Berkeley. Folsom points on surface. Silver Lake and Borax Lake points down to 40″. Rough mortar, cylindrical pestle and crude two-faced matate at 18″, 35″, 56″ depth. Harrington (1938) believes that the Silver Lake and Borax Lake types were Pre-Folsom on this site, but continued into the Folsom horizon. A large coarse type of scraper, however, found down to 8′ depth seems to be definitely Pre-Folsom. Dr. Sauer (Univ. of Calif.) believes the soil to represent an undisturbed fossil alluvial fan and the Folsom points to have been exposed by subsequent erosion.

ANNOTATIONS TO TABLES I–III—*Continued*

Table	No.	Site	State	Remarks
II III	7 1	Yuma Co.	Colo.	Figgins (1934, 1935a) rejects the claim for antiquity on the grounds that the points hail from the surface and the species of bison is uncertain.
II	12	Custer Co.	Neb.	Either Pre-Wisconsin (pre-Folsom?) or Late Pleistocene (Barbour, 1933). No intrusion noted by Strong. On the other hand no definite proof that the bison found here, belongs to an extinct species; thus possibly accidental intrusion? (Bell, Van Royen, 1934.)
II	13	Nuckolls Co.	Neb.	True association according to Cook (1925) and Figgins (1931). However, mammoth found here probably of Mid-Pleistocene age, therefore association possibly not true (Bell, Van Royen, 1934, Harrington, 1932). Sayles (1935) ranks this site with his earliest post-glacial hunting period.
II III	14 19	Hall Co.	Neb.	Circumstances not suggestive of great age. (Bell, Van Royen, 1934). Sayle (1935), however, ranks this site with his earliest post-glacial hunting-period.
II III	20 24	Forest Lake	Minn.	Jenks (1934, 1935) believes the mammoth here to have been contemporary with man about 6000–7000 B.C.
III	8	St. Barbara	Calif.	Rogers (1929) distinguishes three cultures here: the Oak Groove people with crude implements, followed by the Hunting People (about 1000 A.D.) and these in turn by the Canaliño.
III	10	Scottsbluff	Neb.	Undisturbed and true associations (Barbour,Schultz, 1936, Howard, 1935). Three extinct invertebrates were encountered. The orderly change from fresh-water to land-fauna indicates a climatic change and rules out any re-deposition. (Wissler, 1935). The site is older than Signal Butte where no extinct animals were found. (Schultz and Eisely, 1935). According to Lugn: Pre-Wisconsin, others believe: Early Wabash (Late Wisconsin 12,000–15,000 years ago. (Wissler, 1935.) Figgins (1934, 1935a) claims secondary deposition, because the bisons found were disarticulated.
III	20	Frederick	Okla.	According to rate of erosion one estimate of 365,000 years. Hay believes this site to be Early Pleistocene. Cook (1928) and Gould (1929) assume Pleistocene age. Sayles (1935) includes this site with his earliest post-glacial hunting period. Cook (1928) and Sellards (1932) rule out intrusion. Pleistocene man here a possibility. Spier (1928, 1928a) retracted his original belief in a true association. Evans (1930) holds out for redeposition. Marine deposits tend to be stable after deposition, unlike stream deposits, thus possibly disturbance here, especially as no articulated skeletons were found. Therefore the bones were possibly redeposited with the later artifacts. Harrington (1933) also doubts the true association of a Pliocene fauna (*stegomastodon*) with modern artifacts.

TABLE IV

COMPOSITION OF FOLSOM COMPLEX AT LINDENMEIER, COLORADO

Per cent	Implement	Remarks
32.8	Scrapers*	56 % Side-scrapers; rough flakes: 40–60×20–45×7–12 mm. 26.6 Snubnosed scrapers: 21–50×18–40×4–12 mm. 1.6% Thumbnail scrapers 13.4 Broken scrapers (edges) 2.4% End-scrapers (Turtlebacks); large facets on convex surfaces: 53–57×41–49×14–18 mm.
19.0	Various flakes	
13.6	Channel flakes	
11.3	Folsom and Yuma points	
6.3	Large blades†	Leaf shaped, worked at site; 55–90×35–40×7–9 mm.
5.6	Gravers‡	Flat face, needle-like point; 19–55×13–33×3–6 mm.
4.0	Sandstone	For red paint and sharpening awls
3.0	Flake knives	Rough, finely flaked, fluted, rounded ends. Glossy when handled
1.6	Hematite	Rubbed pieces
1.0	Chisels	Points broader than in gravers
0.8	Hammerstones	
0.5	Choppers§	Length Width at Base Edge 71–74 37–43 24–27 mm.
0.5	Incised bone objects	Fragmentary
100.0		Furthermore are mentioned:
	Rubbing-Stones	
	Bevel-edged tools:	Triangular and flat-ended; 25–40×26–33×4–8 mm.

* Combined knife, adze and gouge, used for cutting, dressing and smoothing.[342]
Flake-scrapers: a chipped implement, one side a plane with a thickness of ⅛ or more of its width, with straight or curving sides, retouched along the edge. (The keel-backed, snub-nosed and "ducks bill" scraper types belong here.)
Core-scrapers: a blade with one end or plane, concave base with a thickness of ¼ or more of its width, retouched along the edge.[343]
† Combination of scraper and knife.[342]
‡ Used for engraving and possibly tattooing.[342]
§ Made from core; resembling celts (adze).[342]

[342] Roberts J., 1935, 1936.
[343] Sayles, 1935.

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FACTS AND COMMENTS

BONE "GORGET" FROM A CADDOAN MOUND BURIAL

The theory has been advanced that the pierced-tablet type of "gorget" may have served the prehistoric Indian as an arm guard to protect against the lash of the bowstring, in contradistinction to the ornamental pendant type. Most frequently surface finds, these artifacts are at times reported from burials, where their position in relation to the body may give some inkling as to their use. In only two such instances can we find records of their being in such association with the arm bones as to lend support to the arm-guard theory. Moorehead, in: *Stone Ornaments of the American Indian* (1), describes the skeleton of an adult in the Storey Mound, Ohio, with slate gorgets on each wrist. Lemley (2) found a double-perforated stone tablet beside the arm of a skeleton in a Ouachita River mound near Malvern, Arkansas. It may therefore be of interest to record our finding of a bone gorget (Plate 12, Figure 1) attached to the arm bones of an adult male in a mound burial, apparently Caddoan.

This mound is situated on a small stream in the overflow valley of Red River, about two miles west of the river and near Belcher, Caddo Parish, in extreme northwestern Louisiana. The solitary mound is approximately seventy feet in diameter and eight feet in height, with a three-foot platform projecting northwest for an additional forty feet. Excavations during the past sixteen months have exhibited beneath this platform four stratified levels, each separated by two to three feet of sand fill, the lowest stratum being seven to eight feet below the platform surface and four to five feet below the present surface of the surrounding fields, which have been built up by overflow deposits. Each stratum shows evidence (post molds, charred timbers and roofing, wattle, and so forth) of a building, minutae of which, with associated artifacts and methods of exposure, will be published in a later report. Evidence indicates that they were ceremonial structures, successively built, burned, and covered over, the earliest being on level ground, each succeeding structure on a higher mound. Burial pits start at various levels and cut through the deserted house floors to varying depths. All levels were inhabited by Caddoan peoples, judging by the burial pottery ware and floor sherds according to the pottery criteria established by Walker (3) at the historic Natchitoches site, and by Ford (4) for the entire area, but distinct differences exist between the wares of the two upper and the two lower levels.

The "gorget" described here was found in burial pit 11, one of two large pits which began immediately beneath the third floor (third from surface). This pit measuring 9 by 6½ feet, penetrated the fourth floor and 6 feet below it, for a total depth of 8½ feet from its starting point and 14 feet from the surface. Five fully extended skeletons: three adults, one adolescent, and a child, lay with heads toward the southwest end of the pit. The central skeleton had above the head a large pipe, a plain water bottle, and a knobby bowl with a second water

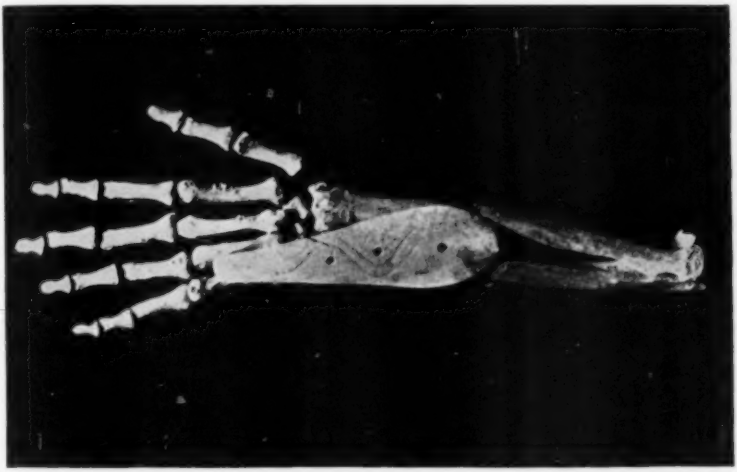
bottle above the head of an adjoining skeleton. Beside the pottery was a mass agglutinated by mineral concretions, consisting of four deer fibulae, an irregular ridged sandstone, several small, partially chipped chert scrapers, and two smooth bones.

The sole other artifact with the burial group was the bone "gorget," lying on the pronated left arm of the central skeleton, attached firmly by mineral concretions to the posterior surfaces of the radius, ulna, carpals, and fifth metacarpal bones. The skeleton was that of an adult male, five feet nine inches in length and apparently robust, whose bones showed no evidence of injury or disease, other than moderate dental caries.

The "gorget" (Plate 12, Figure 2) is of thin, smooth bone, possibly from a deer scapula. It is 6½ inches in length, 2 inches wide at its upper end, tapering to ⅝ inch at the lower end. From side to side it is convex on the outer surface and concave on the inner, thereby fitting the arm more closely. It is practically straight longitudinally, except for a slight outward flare and ridge at the upper end. Three counterdrilled perforations down the midline are 1½ and 1¼ inches apart and 3/16 inch in diameter. The upper and lower perforations show evidences of wear, each at its distal margin, the upper having a distinct notch, suggesting the wear of attaching thongs. Two parallel lines undulate from end to end, between the perforations, forming a serpent design. Except for one crack, which may have occurred before or after burial, the specimen is in excellent condition.

The position of the "gorget" on the posterior surface of the arm raises the question: was it so attached during life? If so, bowstring protection would be afforded only if the bow were held horizontally, not vertically. If attached to the sleeve of a garment, pronation of the arm might change the relative position; if worn as an ornament, any position might obtain. It is worthy of note that the profuse ornamentation with shell beads, pendants, bone hairpins, and ear plugs, found with the later Caddoan burials from the two upper layers of the mound, was entirely lacking for the nine skeletons of burials 11 and 12 from the deeper layers, lending weight to the idea that this artifact was designed for utility instead of ornamentation.

Although the Ohio and Upper Mississippi valleys appear to have been the main centers of manufacture of gorgets and pierced tablets, as well as other stone problematical objects (1), surveys of publications and personal communications indicate that gorgets are not unusual in this area. Jackson (5) reports ornamental circular gorgets of shell with northeastern Texas burials, and also one or two pierced-stone tablets as surface finds. He states (6) that gorgets of shell and stone are found in other parts of Texas, most of the shell specimens from graves, those of stone in the midden deposits. From the Spiro Mound in Oklahoma, Dellinger (7) recently secured five circular shell gorgets, and states that the University of Arkansas collection includes a number of shell and stone gorgets from various sections of that state, but none of bone. Lemley (2), of Hope, Arkansas, who has the largest catalogued collection in



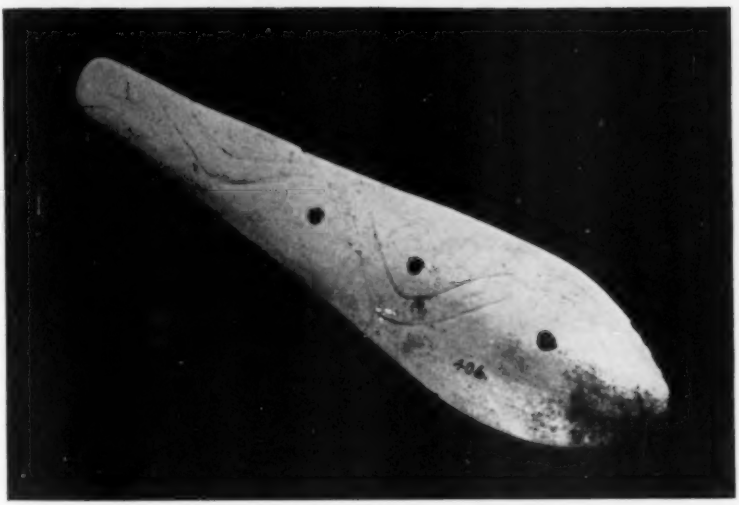


FIG. 1.—Bone gorget in position as found attached to bones of forearm.
FIG. 2.—Gorget showing details of outer surface. Note snake design, and wear at upper hole.

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the state, possesses 334 gorgets and pendants, concerning which he plans shortly to give a complete distributional report.

Gorgets seem to be less numerous in Louisiana. The State University collection (8) has a shell gorget from the Angola burials, and a few fragments of slate or green stone from surface collections in northwestern Louisiana. Neild (9), of Shreveport, has in his collection six stone gorgets, one of them from Caddo Parish. The Louisiana State Normal Museum at Natchitoches has eleven of these objects from northern Louisiana. Our collection, in addition to the specimen reported here, numbers four unbroken and eight fragments of stone gorgets, all surface finds from northern Louisiana, five of them from Caddo Parish. We know of only two or three others in private collections in this area. Moore (10, 11, 12) makes no mention of these artifacts in reporting his extensive investigations of Louisiana mound sites along the Red, Ouachita, and other river valleys, but illustrates two from the Foster Mound on Red River, southwestern Arkansas. Harrington (13) found only four in his southwestern Arkansas explorations; with one exception, surface finds.

It would appear that southwestern Arkansas represents a minor culture center for gorgets, as Patterson (14) found it to be for boat-stones, but that these objects occur to some extent over the entire area of Louisiana, Texas, Arkansas, and Oklahoma. The shell gorgets, more frequently found with burials, are usually round or oval, sometimes have portions of the human face carved on them, and seem to be purely ornamental. Those of stone are more commonly surface or midden finds, usually have two to three perforations, and their use is largely problematical.

No other gorgets of bone have been found in this area, so far as we can ascertain, indicating their rarity. Moorehead (15) states that in his lifetime he has found several of this material, especially in the Ohio mounds (Porter Mound, Fort Ancient), but that in his opinion they are rare.

Conclusion

A description is presented of a gorget or pierced tablet of bone, found attached to the bones of the left forearm of an adult male in a deep mound burial, apparently prehistoric Caddoan, in Red River Valley, Louisiana. While artifacts of this class are not rare in this area, one of this material and in this position would appear to be quite rare. It is suggested that this specimen may have served as an arm guard to protect its wearer from the lash of the bowstring.

C. H. Webb and Monroe Dodd
Shreveport, Louisiana

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EVIDENCES OF EARLY WOODLAND CULTURE AT CHALK BLUFF ROCK SHELTER[444]

Chalk Bluff Rock Shelter is located on the southern end of Chalk Bluff in Section 2, Township 10 South, Range 3 West, nine miles southwest of Murphysboro, Jackson County, Illinois. The bluff in which the shelter is located is an unbroken sandstone escarpment nearly one mile long and having an almost uniform height of 250 feet. This escarpment, lying in a north-south direction and paralleling the Mississippi flood-plain, has a westerly exposure. Here, where the shelter is located, is a conspicuous overhanging cliff offering the shelter ideal protection from the elements. The shelter itself is about sixty feet long and about forty feet wide. This rock shelter is situated about thirty feet above the flood plain. At no time during our work was there any evidence found of stratification suggesting water deposit in the dirt fill. This would substantiate the idea that the shelter was above highwater at all times.

At the time of excavation, the filled-in floor was from four to six feet deep, and contained a large number of fallen slabs and boulders. These were found lying in profusion on the floor. The boulders were in such a position that it was necessary to begin excavating from the back of the shelter and work outward. Just how long these boulders, varying in weight from a few hundred pounds

[444] Knowing for some time the existence of this shelter, a group of interested persons went to the shelter on November 14, 1937, and spent several days excavating. The party consisted of Charles Thomas, Joe Thomas, and Warren Whelpley of Cobden, and Homer Benz, Raymond Benz, Troy Dorris, and the author of Carbondale, Illinois.

to several tons, had been here can only be conjectured. They certainly had the appearance of having been in this position for a very long time.

Judging by the fire-smoked walls, and a few flint spawls, potsherds, and fragmentary bones found scattered about the floor, the writer believed the find important and was certain that further excavation would reveal more interesting remains. As work progressed, it became apparent from the charcoal beds, crematory pits, ashes, and fragmentary animal and human bones, especially those of children, found in the floor debris, that man had occupied the site.

Work was started in the back of the shelter by digging a trench parallel to the bluff down to the original stone floor, five and one-half feet deep. In the process of digging, additional evidence of human occupation was found, including flint chips, bone awls, and potsherds. All the floor debris was taken from the trench and passed through a one-half inch screen. This was necessary in order to secure all fragmentary artifacts and reject material. Because of the dry, powdery condition of the debris, and the large rocks that could not be removed, much difficulty was experienced due to cave-ins.

No burials were found until the trench reached the rock floor of the shelter. The first skeleton was disposed in a semi-flexed position and badly crushed by fallen rock. After the trench was widened to about ten feet, several more burials were found in close proximity; these, apparently, were bundle burials. All burials were tightly wedged between and under fallen slabs, and crushed by the weight of heavy rocks.

The skeletal material offered certain points of particular interest. The fragmentary skulls showed a decided flattening of the frontal bone. Other peculiarities exhibited were a pronounced prognathism (protruding face and teeth), and evidence of pathological conditions. The bones were covered by a thin layer of a grayish-white substance that could not be identified. This same material was also found on the stone floor at the bottom of the trench, covered by about four and one-half feet of debris.

At this stage of the excavation, work was stopped. Believing the find to be one of importance, the writer sought the aid of professional archaeologists. Since it seemed impossible to get someone interested enough to take over the work, some of the material was sent to the Milwaukee Public Museum, Milwaukee, Wisconsin, for study purposes.

Continuing with the excavation a little later, it was decided to widen the trench. A slab weighing approximately one ton was lying on top of the dirt floor. By working carefully, we were able to dig under this rock. Excavation here revealed the cremated remains of a young child, and in juxtaposition was found a large piece of red ocher and a burnt snail-shell bead. This was the only instance of grave goods found with any human skeletal material. Near this cremated body were other evidences of cremated burials, but the large slab prevented further explorations. After digging a few holes on both sides of the slab to see if anything of importance could be found in the dirt, we abandoned work here.

From the animal bones that could be identified, the Virginia deer was found to be the most commonly represented. Also present were the bones of elk, fox, wolf, beaver, woodchuck, squirrel, raccoon, oppossum, and wild cat. Practically all of the bones had been broken, probably done to extract the marrow. Shell remains from several varieties of fresh water mussels and snails were found along with fragments of terrapin and turtle shell. Fish and bird bones were also present. The remains of the animals mentioned here were the most numerous of all materials recovered, and would suggest that a long and continued occupancy existed here.

A few projectile points were found, and a very small amount of flint spawls and chips. The points are crudely made and are of the stemmed- and notched-base types. They are all less than two inches long and suggest a very limited knowledge of flint chipping. The flint recovered was of the flint ball and novaculite varieties, and was brought here by the former inhabitants from the ancient flint quarries near Kaolin in Union County, Illinois. These quarries are about ten miles southeast of Chalk Bluff.

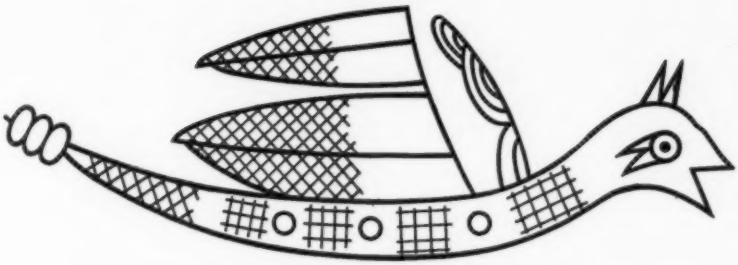
The bone awls and ornaments of bone and shell that were found are very interesting. The bone awls, made from deer and bird bones, are highly polished, and some of them are as much as six inches long. The ornaments are of two types, bone and shell. The former are parts of bird bones made into tubular beads, while the latter are made of fresh-water mussels perforated for suspension. One of the numerous wolf tusks found was perforated.

The potsherds found in this shelter seem to be typical of the Woodland culture. They are all tempered with a coarse grit and have a granular texture. The shoulders are poorly defined while the rims are straight or slightly flaring. Fragments from the base include several examples of flat bottoms; the rest indicate rounded bottoms. The pottery with flat bottoms is very crude and compact. In contrast with the potsherds found in other bluff shelter sites in southern Illinois, those found in the Chalk Bluff shelter have very little decoration on the rims. A few specimens, however, show incised zigzag lines, raised points, and small perforations near the lip. Most of the pottery has been poorly fired in the process of making. The sherds varied in thickness from one-eighth to almost five-eighths of an inch.

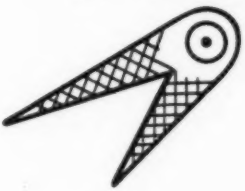
The writer has studied other rock shelters in southern Illinois, and there has always been a marked resemblance in the potsherds, bone tools, and other remains found at these sites. In these shelters evidences of agriculture, such as small digging tools and charred corn cobs,[345] have been found. In none of them was there any evidence of the use of tobacco or textiles.

The Chalk Bluff shelter differs from other shelters in that no evidence was uncovered that might lead one to believe that its early inhabitants knew anything about agriculture, tobacco, or the use of textiles. Judging by the materials

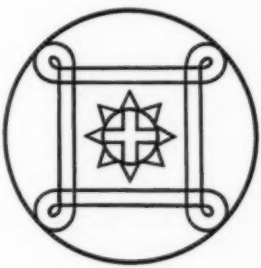
[345] Peithman, Irvin, Bluff Shelters on Indian Creek, Jackson Co., Illinois, National Archaeological News, Vol. 1, No. 11, pp. 6–9, January, 1938.



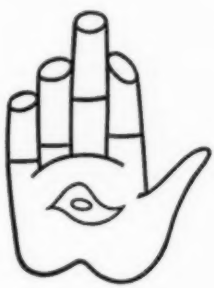
THE WINGED RATTLESNAKE



THE WEEPING EYE



THE
FOUR WORLD QUARTERS
CROSS AND SUN SYMBOL



THE HAND EYE

found in the shelter, the inhabitants were unskilled in working flint, and possibly were unfamiliar with the bow and arrow.

Up until now, the important field represented by such sites has received little attention. In conclusion, the writer wishes to say that he and others are of the opinion that a thorough investigation of these rock shelters in southern Illinois should be made, preferably by some competent archaeologists.

IRVIN PEITHMAN
Carbondale, Illinois

INFORMATION REQUESTED

I am interested in obtaining information concerning any of the accompanying designs occurring on artifacts that are in collections in any part of the United States, and which have not been mentioned in the literature of American archaeology. Anyone owning artifacts bearing these designs is asked to communicate with me and to supply the following information on each occurrence:

1. The exact geographical location where the artifact was found; at least the county and state.
2. Type of site: whether the artifact was found in a mound, village site, cave, or on the surface.
3. Association: whether the artifact was found with a burial or other feature.
4. Type of artifact on which design occurs: for example, on shell gorget, on pottery bottle, on stone tablet.
5. An accurate tracing of the design.

The four examples of these designs shown here (Figure 29) have been taken from the literature, and represent, in as far as I can determine, a typical form of each. There are many variations of each design, and I am attempting to locate these variations as well as examples of the typical forms. The names of these designs have been taken mostly from the writings of Clarence B. Moore.

Any communication should be forwarded to me at the following address: Museum of Archaeology and Anthropology, University of Kentucky, Lexington, Kentucky.

JAMES R. FOSTER
Junior Archaeologist
Tennessee Valley Authority

CORRESPONDENCE

GETTING DOWN TO BUSINESS

From a Collector's Point of View

Speaking to "collectors," How many of you have ever thought of this collecting business in purely a business sense? It's a matter well worth considering. First, there's the question of value, present and future. Then there is the matter of ways and means of enhancing the worth of what you may have on hand. Third and last comes that inevitable and baffling problem of ultimate disposal.

Of all the conceptions of value in relation to our subject, I quote for you the *only one* that I have found that will stand up under analysis and still remain valid: "The value of all artifacts of ancient Indian origin, taken singly or collectively, either in a museum or a private collection, must be in direct ratio to how much can be learned from them." (Through a series of letters on the question, between E. A. Doolittle, of Painesville, Ohio, and the writer, this sense of value was worked out and chosen as our criterion, some six years ago.) Try to regard the value in any other sense and you will travel up a blind alley. Supply and demand? There is little demand for materials of this kind as a house decoration these days. (That women don't like them as a rule, is quite well enough known, but sometimes they are tolerated in a den, and among collectors there are bachelors, of course.) Dealer's list prices are good for the dealer; and purely for argument, I suggest, such may be a dependable valuation for old coins or postage stamps. However, such a comparison is absurd. Artifacts of ancient Indian origin may often be of much greater worth in one place, or in one collection, than they could possibly be in another, in view of association with other material which includes, at times, Indian remains. And when their identity, in this sense, becomes lost through a marketing process, I ask, where is the value?

If you wish to compare further, remember there is "something human about this. . . ." Whether from ancient dwelling places of the Indian, his mounds, or his burials, or from the records and material we have acquired, the existing evidence and the potential evidence is all that is left, on earth or under the earth, through which the prehistory of his people can be traced.

Of future value, I believe it is sufficient to say: When this basis for valuation is accepted, and becomes the bases of our methods, the worth will endure through any future time.

To enhance the worth of a collection, the ways and means must fit the special requirement of each case, depending on locality, and the individual's methods. So let us get down to the business of stock taking to see how we stand, and to find out whether our purpose, methods, and records are as sound as they should be. There are all kinds of ways of looking at this collecting business, and about as many different ways of going about it. Each individual "writes his own ticket." Out of this, different periods of progress can be established, and self scrutiny will show where we belong.

I recall correspondence with a fellow collector in Massachusetts who was much concerned about "fakes." He had been taking stock, and said: "It always takes so much of the joy out of life when I discover that one of my pet specimens is 'phony' that it always makes me sorry I ever found it out." (What a queer confusion of thought!)

While looking over an old time collection—surface finds picked up by a man who had spent his past "three score and ten" on the farm, I asked, among other questions, how he began collecting, or what purpose had prompted him "Oh," he said, "I've been at at ever since I was knee-high to a grasshopper. I know I often got licked for it, and I think I must have always had a kind of weakness that way!"

The most evident "weakness" was the absence of data records in any form, an all too common one in our rural districts. But in this instance there is potential evidence well worth salvaging. Most of the material is from places in his close neighborhood, including many shore finds along a stretch of the Grand River, about three miles each way from his farm. And several specimens I believe to be isolated records for Ontario that must mean something!

Now here's a two-way opportunity presenting itself for a collector in this vicinity, or for one who has acquired material from the same area. (1) By salvaging all possible data (before it is too late) he will preserve the latent evidence in this collection (a good enough thing in itself). (2) By associating the records, thus preserved, with those of his own for identical places, he will employ a form of co-ordination that will enhance the worth of what he may have on hand—and one that is among the best.

As a collector, I hold to the idea that data as recorded with associated objects is of greater importance, and worth, than the objects could ever be in themselves. With this as a basis, the writer's principal activity during the past five years has been a form of co-ordinated salvaging and recording; and if the idea became a general practice, I believe there would be a notable advancement among collectors as a whole, and their work would be of great assistance to archaeology.

The same idea affords a special kind of guidance, that will direct us beyond the pitfall of mere acquisition—that state of mind so well described by "I got!" The "I got!" period is a go-getting period; there is a rivalry in it, and its playmate is destruction. The advancement made, in this kind of business, is determined through the immensity of display in the collector's cabinet—his show window. I wonder how much can be learned from that. The greater the numbers, the more there will be to wonder over—like the stars above. Well, you can spend a lifetime gazing at the stars, each night, but unless you have been instructed in some way about the science of the heavens, they will merely twinkle, and you can still wonder what they are.

Enthralled by amassing "relics," the victim has little or no time for taking stock in regard to purpose, or methods; but sooner or later he will want to have some of the "know" about the material he collects. Then, to have enlighten-

ment, he must take his troubles to "the doctor"—either the professional archaeologist, or a student of the subject who has collected with some intelligence. No matter how wrong the methods may be, he should have enlightenment *if* it will lead him to something better. There are men whose purpose is sound, but who are wrong in their idea about methods; and a wrong beginning cannot bring a right ending.

For example, a "new" collector, that is a beginner, came to me a while ago wanting some "tips" on how to properly record data. I explained that it was necessary to know something of his purpose, or what he had in mind. His field was "a number of old Indian camps and village sites in the neighborhood." One, he believed, was new—never been exploited! From this site, and others, he proposed to collect specimens, properly record them, and then consult the archaeologist by means of a questionnaire. Thus, having the archaeologist's help and knowledge attached to the work he was "willing and ready to do," something would be known of the Indians who once dwelt in the district. Thus, while he gained some of the "know," archaeology would benefit by his activities. "Your purpose in seeking cooperation is quite right," I said, "But otherwise you have things twisted and are all wrong; you would fail because you have written your ticket without having proper advice. Such an undertaking would react on the purpose like a boomerang! Do you know what you'd really be doing? You would be destroying the evidence required for the archaeologists to answer the very things you wish to ask and know about. More than that, you would overlook evidence and thus destroy records of other things in connection with the prehistory of these sites, perhaps of the greatest importance to archaeology. That would not be cooperation at all; it would be directly the opposite!"

Let us close in and examine some of the recent research reports. Anyone who has the right kind of a thirst for knowledge of methods can see that in scientific excavating there is no "monkey business!" Under the earth is to be found the closest possible association of artifacts and numerous other things; if their situation is disturbed in the least, it can never be restored, and proper records of these intricacies are necessary for the story.

Some collectors have a penchant, or a "weakness" for digging, and knowing they are wrong (like our friend in Massachusetts), it makes them "hot under the collar" every time they find it out.

To make collecting worthy of continued existence, it is well to seek the archaeologist's advice. On the strength of the cooperation which followed such a course, in my case, thus proving its worth, I will pass on the basis of it—summed up in this simple code: To successfully cooperate we should bring our activities under control and use restriction, so that whatever we do will be complimentary to the work of the archaeologist, and not competitive.

The problem of ultimate disposal confronts us with limitations as never before. At the present time many museums are overcrowded, and recent advancements in the archaeological field bring further restrictions. The outlook

is toward a period of sifting—a "house cleaning" from which there will survive few exhibits bearing the old familiar label, "Presented by ———." I take it that our collecting should be considered a custodianship rather than an ownership, and our records, more than the material, will show "Who's Who and Why."

When you have a three-in-one collection, as I have, the problem is more complicated. One part, a reference collection of projectile points, a series of representative types which has now served its purpose, could be sold. The other two interlock; i.e., material personally collected from a stretch of the Grand River Valley extending twenty miles upstream from Lake Erie, and of greater value, research records for this area, including salvaged records from a number of collections, which in a sense I have made my own, as a custodian. Sell these? No! I think there's something human about them, both Indian and of myself.

In winding up our collecting "business," we may rest assured, and nothing can efface the fact, that: "The good will live, the bad will die, and tomorrow will tell us which is which."

P. M. PRINGLE
Toronto, Ontario
Canada

SUPPLEMENTARY NOTE ON CORNER-TANG ARTIFACTS

In last October's issue of AMERICAN ANTIQUITY (Vol. 4, No. 2, pp. 152–154) I published a brief note on corner-tang artifacts. The material contained therein had been collected and submitted during the summer of 1937. It is only fair to state that since that time Dr. Patterson has published in the University of Texas Bulletin, no. 3734, Anthropological Papers, Vol. 1, No. 5: *Supplementary Notes on the Corner-Tang Artifact.*

In the article he embodies, with three noteworthy exceptions, most of the occurrences of the corner-tang artifacts covered by my brief note. In addition to the list of states given by me, Dr. Patterson reports these artifacts from Illinois, Iowa, Nebraska, and South Dakota. The number of counties in Texas where these artifacts have been found increased from seventy to eighty-three, and the total number of corner-tang artifacts known to Dr. Patterson grew to 725.

Dr. Patterson gives as present boundaries of the corner-tang artifacts fourteen states, located between the Mississippi and the Rocky Mountains, extending from Texas (the presumable place of origin) to Montana. The map in Dr. Patterson's report showing the central states indicates the four states of Louisiana, Minnesota, North Dakota, and Wisconsin without any reported occurrence of corner-tang-artifacts. Of the three exceptions, by which my tabulation exceeds Dr. Patterson's list, two fit in neatly with his distribution, showing occurrence of corner-tang artifacts in the two states of Louisiana and

Wisconsin, contiguous with his area of distribution. The third exception represents a thus far isolated occurrence in Pennsylvania.

On November 10, Dr. Patterson informed me that since his last publication, he has received a large number of additional records, including some from Minnesota, North Dakota, Wisconsin, and Canada. This leaves as a new contribution on my part only the occurrences in Louisiana and Pennsylvania.

HANS E. FISCHEL
Department of Anthropology
Berkeley, California

FOLSOM AND YUMA POINTS FROM SASKATCHEWAN

Several years ago, after intensive studies of the Folsom "problem," it seemed to be apparent that the more finely chipped Folsom and Yuma points were coming from the Great Plains province. This, in general, has been shown by evidence produced principally from New Mexico, Colorado, and Nebraska.

It was logical therefore to expect similar evidence to be forthcoming from the Great Plains region of Canada. Two men in Saskatchewan: Kenneth H. Jones of Mortlach and Burt S. Gunn of Pense, have been finding beautifully flaked points of the above types for the past several years in the southern part of the province, near Regina, under conditions that are almost identical to those prevailing where similar points are found within the United States. D. J. McKillop of Regina also had a number of Yuma points in a collection that he showed to me.

Having been in correspondence with Mr. Jones for several years, I had promised myself at the end of each summer's field work to make a trip to Saskatchewan and see these localities for myself. It was not till the end of August and the early part of September of last year that I was able to carry out this intention. I spent several days in and around Mortlach and the country between there and Regina, which offered an opportunity for investigation of the areas from which both Folsom and Yuma points had been reported, and to study the collections made by Mr. Jones, Mr. Gunn, and others.

The same pattern is discernible here as in other Folsom and Yuma sites. The points are not only similar, but they are coming from areas that show the same unmistakable signs of a changing environment. All are from places that have been eroded by the wind. These places are described by those who have found them as "blow-outs," "wind-blown bottoms of small dry lakes," and "shallow wind-blown ravines."

The sites from which the collections of Folsom and Yuma points were made roughly comprise a fan-shaped area northwest, west, and southwest of Regina, with a radius stretching west about one hundred miles and northwest to the South Saskatchewan River. Some, however, were said to have come from southeast of Regina, in the sand hills near Estevan. The area which I investigated was mostly that in proximity to Mortlach, about seventy-three miles

west of Ragina. The principal sites from which Mr. Jones had secured his specimens were from three-quarters of a mile to two miles north and slightly east of the town of Mortlach. Mr. Gunn's Yuma points are from the districts of Osage, Pontiex, and Pense.

In this sector, west and northwest of Regina, as the sectional maps of the Canadian Government show, are many non-perennial streams and non-permanent lakes, which during periods of prolonged drought such as have occurred in recent years, are greatly eroded by the wind. The flood plains of the small streams, the dry basins and "blow-outs," caused by the breaking up of the land by the plow, are the places which were pointed out to me as those where Folsom and Yuma points have been picked up.

Quoting from a letter from Mr. Gunn relative to some of the points which appear in the accompanying plates, he refers to his most important site as a typical "blow-out," " . . . erosion having proceeded to a depth which I estimate to be three and a half feet. Erosion islands show that about eighteen inches of the original top soil was a dark brown, sandy loam, after which the texture graduated rapidly to a fine yellow sand which goes down to an unknown depth. This sand is of glacial origin. I have been sufficiently familiar with this particular site during the past four years to say definitely that the Yuma complex was not present in the dark brown upper soil, although there was no lack of the more recent plains types of projectile points in it. It was apparently at about the eighteen-inch level that the Yuma types started to show up, together with their associated artifacts, and a few are still coming to light although weather conditions during the past summer have been such that little further erosion has taken place."

As for the artifacts themselves, the plates show the best examples. The similarity to types from Texas, New Mexico, Colorado, Nebraska, and some of the bordering states is readily observed. Three of the specimens shown are Folsom types. Mr. Jones has found an additional one since I was at Mortlach, and judging from his drawing, it is obviously Folsom. The other points shown are all Yuma types.

Plate 13 shows the flaking art at its best. All are patinated on one side and are made of a chalcedonic material. Number 1 belongs to Mr. Gunn, and numbers 2 and 3 to Mr. Jones.

Plate 14, Figure 1, reading from left to right, beginning at the top, shows: numbers 1–3, leaf-shaped points with no fluting on the faces. Numbers 4–6, Folsom points, though the fluting is not very easy to see in the photographs. All of these belong to Mr. Jones, and can be duplicated from collections made at Clovis, New Mexico, and from Texas and other sites in the Great Plains region of the United States. Number 5 is the broken base of a Folsom and is exactly like specimens from Folsom and Clovis, New Mexico, and sites in Texas and Colorado. Number 6 is almost an exact duplicate of one from southwestern Kansas, except that the material is red jasper instead of a white quartzite.

Plate 14, Figure 2, shows Yuma types. Number 1 is of a reddish-yellow

Actual size.

FIG. 1.—Scale ½.

FIG. 2.—Scale ½.

FIG. 3.—Scale ½.

FIG. 4.—Scale ½.

jasper, polished like old furniture; numbers 2 and 3, of a brownish chalcedony, patinated on one side. Number 1 would be classed by Renaud as his Type 4b. Numbers 1 and 2 belong to Mr. Gunn, and Number 3 to Mr. Jones.

Plate 14, Figure 3, shows small gravers exactly like specimens from the Lindenmeier site in Colorado, and from Clovis, New Mexico; also small scrapers of jasper, and fragments of Yuma tools, with fine secondary chipping along the edges. Numbers 1–5 belong to Mr. Gunn, and numbers 6–9 to Mr. Jones.

Plate 14, Figure 4, shows an interesting blade of chalcedony, placed between two others for comparison. It is very thin, and is heavily patinated on one side only. These were acquired for the University Museum, Philadelphia, and were said, by Mr. McKillop, of Regina, to have come from the same sort of "blow-out" as the others in this region. While it has a sort of Solutrean leaf-blade look about it, the flaking seems to be finer than on the French blades.

All credit is due Messrs. Jones and Gunn for their interest in their local archaeology, for their keen observation, and for reporting their discoveries for the purpose of aiding in a broader knowledge of the subject. Thus they have extended northward, through the Great Plains, evidence that Folsom man had passed that way at some time or other in his pursuit of the herds of bison and other animals that lived contemporaneously with him.

Many bison bones were seen in the various "blow-outs" visited, some obviously recent; others, however, giving the appearance of being in place in the bluish silts which at one time covered them to a greater depth than now observed. Several specimens of vertebrae, shoulder blades, and so on, were removed from considerable depths below the present surface of the "blow-outs." Whether enough of the skeleton was recovered to make a proper identification is doubtful as no skulls were seen. No mammoth remains were found. A more intensive search might reveal a closer association of human artifacts with extinct bison and possibly mammoth bones in these Saskatchewan "blow-outs." It has already been pointed out how strikingly similar is the appearance of these "blow-outs" or basins to those at Clovis, New Mexico. These brief notes are recorded with the hope that further and more extended research can be undertaken by others working upon this problem.

EDGAR B. HOWARD
University Museum
Philadelphia, Pa.

NOTES AND NEWS

PACIFIC COAST AREA

During the summer of 1938 the University of California Department of Anthropology completed its third season's archaeological work in the Delta region in the vicinity of the cities of Sacramento and Stockton, California. Since the publication of evidence of two cultural horizons in the region, by Lillard and Purves of the Sacramento Junior College, the University has been interested in obtaining further evidence.

The first two seasons' field work was aided financially by Mr. and Mrs. Beverly Blackmer. The field work has been in charge of Mr. Robert F. Heizer. The field crews have been students of the University who have generously volunteered their services. During 1938 the personnel of the field crew comprised Gordon W. Hewes, William C. Hohenthal, William C. Massey, Russel W. Newman, Graham E. Schmidt, and Joe Ben Wheat. In addition, the 1938 expedition had the benefit of the aid and advice of Mr. Franklin Fenenga, who is in charge of archaeological field work for Sacramento Junior College, directed by President Lillard.

Large additions to the collections of the University of California Museum of Anthropology have resulted from the three seasons' field work. Moreover, a clearer picture of the cultural inventory of the early horizon has emerged. Besides excavation work, a considerable amount of reconnaissance was conducted, resulting in the location of about fifty new sites and apparently bringing the survey of the Delta region to the same relative completeness as the earlier N. C. Nelson survey of the San Francisco Bay region, which adjoins the Delta on the west. A preliminary report on the archaeology of the Delta region, by Heizer and Fenenga, has been submitted for publication. (E.W.G.)

Professor L. S. Cressman, Department of Anthropology, University of Oregon, Eugene, Oregon, reports that June 5th to 17th a reconnaissance for the Oregon State Museum of Anthropology and the Department of Anthropology was carried out along the Columbia, the John Day, and the Crooked rivers, by a party of seven under the leadership of A. D. Krieger. This party established a number of promising sites for future excavation, collected some material, and examined and photographed a large number of private collections.

Three days after the return of this party, Professor Cressman, with a party of ten students and a cook, undertook a six weeks' expedition and excavated three caves in eastern Oregon, one at Roaring Springs Ranch, one near Paisley, and a third near Fort Rock. The field work was supported in part by the Carnegie Institution of Washington, through the hearty cooperation of President J. C. Merriam.

At both Fort Rock and Paisley the sequence of cave occupation was revealed as interrupted by a stratum of pumice. The manner and time of the deposition

of pumice are problems being studied by Professor Howel Williams, University of California.

In the Fort Rock Cave, the pumice was evidently hot when it fell, as revealed by nearly 100 shredded sage brush sandals, all charred, which were removed from beneath the pumice. The sandals are similar to those found in Catlow Cave No. 1, about 30 miles south of the Roaring Springs Cave excavated in 1935 and 1937.

Of interest is the complete absence of basketry remains in the Fort Rock Cave, in spite of the favorable conditions for preservation. The obsidian implements from beneath the pumice in this cave are very crude.

Two complete atlatls were discovered in excavating Roaring Springs Cave in Catlow Valley, southeastern Oregon. The cave deposit was very definitely divided into two distinct beds, each about one-half meter thick. In the lower bed were large numbers of chipped knives, scrapers, and projectile points, but only one artifact of vegetal material, a well preserved fragment of a tule mat. This specimen, and scraps of unworked vegetal remains, show that conditions of preservation were favorable. The upper bed was termed the "straw bed," for it bore large quantities of matting, basketry, and loose vegetal materials. About half way through this upper bed, at a depth of about .3 meter, under a rock lip one-quarter of the distance from the front of the cave, were the two atlatls, lying about 6 mm. apart, at the same level. One lay with the hook down while the other was reversed. Instead of a channel for the projectile, they are concave from side to side. The larger is 62.3 cm. long and 6.4 cm. wide, while the other is 42.2 cm. by 4.1 cm. The grip is of the finger-notch variety, instead of loops or finger holes. Both are painted red and one is further decorated with rows of white dots. One still has the grip wrapped with leather.

About three-fifths of the distance toward the back of the cave, starting at or very close to the undisturbed surface and continuing to a depth of 3.5 cm., was a grass-lined cache pit. In the matted straw, probably in the top of the pit, along the north side, was a bison-hide moccasin. Associated with this, among other things, were the two ends of a sinew-backed bow. Further down in the pit, near the center, was another fragment of the bow; this and one of the end pieces fitted together. In sievings from the pit the hook of an atlatl similar to the other two was found. Unfortunately, it was not *in situ* and thus lacks diagnostic value. The bow evidently dates from the time the pit was dug, or that of surface occupation. The atlatl hook may have been disturbed in the digging of the pit, and then became associated with the cache. The bow and other artifacts from the cache were all observed *in situ*. No conclusions concerning the relative time of the bow and the atlatl can be drawn from this find because of the fact that the atlatl hook came from the sievings. There may be connection, but present information concerning these specimens does not permit valid deductions. (*E.W.G.*)

GREAT PLAINS AREA

The archeological survey of the Nebraska Historical Society, directed by A. T. Hill and Paul Cooper, spent over six months in the field during the 1938 season with a W.P.A. crew of from fifteen to thirty-five men. In continuation of its previously begun program of surveying the west bank of the Missouri River in Nebraska, work was confined to four counties bordering that stream north of Omaha, where excavation was completed at thirty-one house sites, six burial mounds, and four burial areas. Fourteen of the house sites, all of the mounds, and one of the burial areas investigated occurred in a restricted area at the north edge of Omaha in the immediate vicinity of Robert Gilder's "Loess Man" finds.

All the house sites excavated appear to be referable to the Nebraska culture, although in this area (especially toward its northern limits) Upper Republican ceramic elements become more numerous. Also, occasional pieces point to a rather direct influence from some Middle Mississippi manifestation. The dwellings were invariably rectangular and built in an excavated pit, and in general varied in no respect from others previously excavated. Exceptions were two houses with corner entrance passages, and two with two entrances. In the latter, the two entrances were in adjacent sides of the structures.

Burials were of various types, including primary and secondary burials in mounds as well as primary and secondary burials in pits. Bones in secondary burials were frequently burned, and in one mound the remains of approximately twenty-five individuals were mixed with and covered by lightly burned earth, the burning having occurred prior to the final deposition of the earth. Occasional sherds of Woodland type occurred in the fill of both mounds and pits containing both primary (usually flexed) and secondary burials. While none could be confidently considered as intentional inclusions, such occurrences constitute additional information regarding what now appears to be a statewide distribution of evidences of Woodland occupation. (*W.R.W.*)

The combined Columbia University-North Dakota State Historical Society expedition to North Dakota spent two months excavating in a prehistoric Mandan village across the Missouri River from Bismarck, and in an early historic Cheyenne village on the Cheyenne River near Lisbon in eastern North Dakota.

At the Mandan site (or old Fort Abraham Lincoln village) evidences of a long occupation were secured. Corn cellars and refuse deposits occurred to a depth of ten feet. In the uppermost houses, burials on the floor occurred, probably resulting from the smallpox epidemic of 1781 which led to the abandonment of the village. Other burials were found in cache pits, and much data on house types, ceramics, and other cultural remains were secured.

On the Cheyenne River a large fortified village was mapped and seven earth lodges were excavated in whole or in part. These proved to be of various sizes, all having a four-post central foundation. The largest lodge was identical with

that of the Arikara and Mandan some two hundred miles to the west. The other lodges were similar but showed local variations. Abundant pottery was secured at the site along with contact material clinching the identification with the Cheyenne village destroyed by the Chippewa about 1750 or slightly later. The pottery shows the influence of Mandan to the east, but is generally decorated with delicate incisions rather than cord marking. In a few cases glass beads were inserted for decoration. Preliminary examination suggests the relation of this ceramic type to certain others in the Minnesota woodlands plus strong influence from the sedentary culture of the upper Missouri.

In addition, the expedition made excavations in early historic Hidatsa sites in order to determine the ceramic type present at the time of contact with the whites.

Two members of the expedition carried on ethnological research among the living Arikara and Hidatsa Indians on the Fort Berthold Reservation. The demonstration that the Cheyenne, as late as the middle of the 18th century, were a farming and sedentary group is regarded as especially important. (*W.R.W.*)

U. S. National Museum investigations in Kansas and Missouri during the summer of 1938, directed by Dr. Waldo R. Wedel, had a dual primary purpose: (1) the locating of additional Hopewellian village sites, and (2) the collecting of data bearing on the origin of stone-walled burial enclosures about Kansas City. Records on nearly a dozen Hopewellian village sites were obtained, most of them in or very near Kansas City, which appears to cover what must have been a densely inhabited area at some prehistoric time. The origin of the burial enclosures remains undetermined. Eight of these features were excavated; two yielded the remains of long-headed skeletons, tallying in this respect with Fowke's earlier findings near the Renner site. Nothing diagnostic in the way of artifacts associated with the graves was found, but in several instances the intrusive character of Middle Mississippi pottery was definitely established. Fire seems to have played a rather important role in the mortuary rites, but the evidence awaits thorough analysis. It is believed that the culture manifestation represented by these graves belongs to one of the earliest—if not the earliest—pottery horizons in the Plains area.

About half the summer was devoted to the excavation of a large Middle Mississippi village and burial site on the Platte River near Farley, Missouri. One rectangular pit house with four center posts, and a vestibule entrance, as in the Nebraska Culture lodges, was opened. There is good evidence that this type of structure was typical in the site. The pottery was shell-tempered and commonly incised, being very similar to some of the intrusive sherds previously reported by Strong, Gilder, and Cooper from Nebraska Culture sites. Effigy handles are quite common; in many cases they represent bird or animal heads which were apparently balanced with a tail on the opposite side of the vessel.

On the hill immediately above the village, a cemetery was opened which

contained over eighty burials. The great majority of these were extended primary burials, but there were also a few bundle and two flexed burials. The bones were in poor condition, but indicated a broad-headed, short-statured physical type, quite distinct from the remains found in the stone enclosures. Artifacts were scarce, but six or seven complete and restorable shell-tempered vessels conclusively linked the cemetery with the houses below. This is the first Middle Mississippi village and burial site to be excavated so far west. It ought to help clarify the interrelation between Nebraska and Middle Mississippi manifestations on the Missouri.

About ten miles up the Platte from this site, a large mound was briefly investigated. It had been partly demolished with tractor and scraper. The mound seems to have been upwards of ten feet high at one time, and the badly mutilated profile which still stood showed evidence of a layer of stone slabs about half way down. Near the bottom were detected traces of logs or split timbers. There seemed to be numerous flexed (?), mat-wrapped burials in the sub-slab portion of the mound.

Two weeks in August were spent exploring caves in the Purgatoire Canyon, and open camp sites in Baca County, Colorado. No sites indicative of ancient man were found, although various local collectors had plenty of Folsom and Yuma artifacts. From some of the caves were obtained tubular bone and shell disk beads, bone awls, chipped flints, and grit-tempered, cord-roughened pottery. This material appears to be a westward extension of the Plains Mississippi wares. (*W.R.W.*)

NORTHERN MISSISSIPPI AREA

A University of Michigan field party, under the direction of Dr. E. F. Greenman, spent the summer in investigations on Manitoulin Island and vicinity. A primary purpose of the work was to find, if present, evidence of historic Indian occupation. No sufficiently early historic sites were discovered on this island.

A site on the south shore of Providence Bay yielded both Iroquois and Woodland types of pottery, and bundle burials. There are village sites at the upper ends of most of the deep bays on the island.

At a former beach at Swift Current, on La Cloche Island, consisting of a sand ridge about one-half mile long, 26 feet above the present water level, was found a hearth about four feet in diameter. Flint chips and food debris consisting of animal and fish bones were encountered at the same sub-surface level for a radius of ten feet about the hearth. The identity and age of the beach have yet to be determined by a glacial geologist.

What appears to have been an early historic site was found on the shore of McGregor Bay, Wardrop Island. Brass kettles (containing wooden bowls), buttons, trade axes, spindles, knives, four types of glass beads, strike-o-lights, flints, and cloth preserved through contact with brass were associated with a stone plummet, bone harpoons, a stone disc, a stone pipe with a human head

carved on the bowl, bone awls, and flexed burials with stone slabs erected around the graves. There were no mounds and no evidence of pottery. (*T.D.*)

The 1938 archaeological excavations of the University of Minnesota were begun June 14 and concluded on September 29. A class of four students assisted Dr. L. A. Wilford for the first eleven weeks, and for the last six weeks the work progressed with the aid of eight W.P.A. laborers. Investigations were confined solely to Minnesota.

One month was spent in west central Minnesota at Glenwood on Lake Minnewaska. Four mounds of a large group on the north shore of the lake, and a large single mound on the south shore, were excavated. These proved to be mounds typical of the Kathio forms, with secondary burials, unaccompanied by mortuary objects, on or above the mound floors. Interesting features of the large single mound were the presence of small uncharred poles over the bundle burials, a low stone cairn on the floor of the mound at one end of the burials, a cremation in a pocket in the side of the mound, and the primary burial of a headless bison calf in the dirt of the mound.

The second month was spent in north central Minnesota, the area in which the Blackduck type of pottery is found. Heretofore the only component of the Blackduck Focus investigated was a village site on Blackduck Lake, and the discovery of a burial mound of that focus was one of the principal aims of the expedition. Such a mound was found on the Bowstring River in northern Itasca County. The mound had been built on a former village site, and forty primary burials were found in pits below the mound, on the floor of the mound, and above the floor. The burials were in the fully flexed sitting position, and seven were accompanied by pottery jars of the Blackduck type. With this knowledge of the burial traits of the Blackduck focus, this focus can no longer be classified under the Mille Lacs Aspect.

The final six weeks were spent in south central Minnesota. Two mound groups and a village site on the Minnesota River in Blue Earth County, and a village site on the Blue Earth River in Faribault County were investigated. The mounds were low and circular or elongated. In those mounds not already rifled, a single shallow pit was found in the center of each mound, with a group of primary burials in each. No sherds were found, although Oneota Aspect sherds are plentiful in this region. These are probably not Oneota mounds, however, and may belong to an earlier Woodland culture.

A village site a few miles from these mound groups yielded a quantity of excellent Oneota material, but had been too much disturbed by earlier excavators for any study of stratigraphy or architectural features.

The village site in Faribault County had been largely destroyed in the removal of gravel. The remaining portion had been left undisturbed and was carefully excavated. Thirty storage pits were found, filled with refuse. No skeletons were found in the pits, though such burials were reported as having been found while the gravel was being taken. Quantities of Oneota sherds, triangular

arrow-heads, end scrapers, and bison scapulae dressed as hoes or shovels were the principal objects found. (*T.D.*)

OMISSION

In Volume 3, No. 2, pp. 192–193, in the report on the Anthropological Section meeting of the Illinois State Academy of Science at Rockford on May 7, 1937, the following papers presented at that time were inadvertently omitted from the list:

Recent Excavations at the King Mounds—Mrs. Fain W. King, Wickliffe, Kentucky.

A Red Ochre Mound in Fulton County—Donald Wray, Peoria Academy of Science, Peoria. (*T.D.*)

SOUTH AMERICAN AREA

Investigation in the field of South American archaeology, particularly the Andean region, has been exceedingly active in the year 1938. Dr. Heinrich Doering, Director of the Munich Museum, has spent a full year in Peru excavating in the North Coast region, particularly in the valleys of Chicama and Pacasmayo. One of his outstanding discoveries was a mummy belonging to the Early Chimu period, accompanied by textiles, including tapestries, ginghams, and embroideries. Dr. Doering is also completing a survey of the Andean region by extensive trips to Cuzco and Bolivia. Dr. Hans Diesselhoff of the Berlin Museum has been working with Dr. Doering, but has also carried out independent investigation in the Cajamarca district and on the coast of Ecuador.

Dr. Herbert J. Spinden of the Brooklyn Museum has completed a three months' survey trip of Colombia and Ecuador, as well as parts of Peru and Bolivia. He has made a study of private collections in Colombia and Ecuador in the hopes of disentangling some of the ceramic complexities of these countries.

Dr. Wendell Bennett has continued the archaeological program of the American Museum of Natural History in eight months of survey and excavation in the northern islands of Peru, particularly in the Huaraz section of the Callejon de Huaylas and at the ruins of Chavin. Preliminary results show a sequence of Recuay, followed by a mixed Tiahuanaco, in turn followed by late Chimu and Inca influences in the Huaraz region, and the identification of incised black and brown ware with the ruins of Chavin. The Chavin type ceramics have long been known on the coast of Peru and apparently are part of the highland complex as well, with, however, certain differences in ceramic shapes.

Dr. Julian Steward of the Bureau of American Ethnology is now in Peru surveying archaeological and ethnological possibilities.

Dr. Stig Ryden of the Stockholm Museum is now excavating in highland

and lowland Bolivia, continuing work at various sites first described by Nordenskiold.

Dr. A. Kidder, II, has obtained permission from the Peruvian government for extended excavations at the ruins of Pucara in the southern highlands of Peru, important as a center for a new-type ceramics and stone carving. His work will also include excavations in the little-known region of Arequipa. This work is under the auspices of the Peabody Museum at Harvard.

Dr. A. Sorriano Infante of the Huaraz Museum is making a survey of the Callejon de Huaylas ruins for the Institute of Andean Research.

Part of the Temple of Pachacamac near Lima is now being cleared in anticipation of the forthcoming Congress of the Pan American Union. The work is under the supervision of Dr. Luis E. Valcarcel, Director of the National Museum at Lima, and Dr. Albert Giesecke. Preliminary discoveries include new frescos and a large, elaborately carved wooden idol.

Dr. Julio C. Tello of San Marcos University is preparing his report on excavations in Casma Valley where, in the past year, he discovered ruins of sub-Chavin type at Cerro Sechin and Moxeque. The discoveries of Dr. Tello's 1937 expedition are the most important in recent years.

Such concentrated field work in the Andean region has long been needed and one can anticipate valuable results. (*W.C.B.*)

GENERAL

Mr. E. W. Gifford, for many years affiliated with the Department of Anthropology, University of California, and Curator of the Museum of Anthropology, has been promoted to the rank of Associate Professor.

Dr. Arthur R. Kelly, formerly Associate Archaeologist with the National Park Service, has recently been appointed under civil service to the newly created position of Chief, Archaeological Sites Division, Branch of Historic Sites, National Park Service. The Branch of Historic Sites has been reorganized with two divisions, Historic Sites and Archaeological Sites. In the administration, survey, planning, and development of areas under the jurisdiction of the National Park Service, archaeology and history are now recognized as separate, although closely related research and survey fields.

Dr. Wendell C. Bennett, formerly Assistant Curator of Anthropology at the American Museum of Natural History, New York City, has accepted an anthropological appointment to the teaching staff of the University of Wisconsin.

A recently established Archaeological Laboratory of the Department of Anthropology, Columbia University, is under the direction of Dr. W. D. Strong.

BOOK REVIEWS

Archaeological Excavations at Kukulik, St. Lawrence Island, Alaska; Preliminary Report. OTTO WILLIAM GEIST and FROELICH RAINEY. (Miscellaneous Publications of the University of Alaska, Vol. 2, PWA Project no. 417, 391 pp., 78 plates, 8 maps, 45 text figs., 17 unnumbered figs., Washington, 1936, released 1937.)

This is a remarkably handsome volume, generously supplied with excellent maps, diagrams, and plates, in addition to the charming pen-and-ink sketches by the Eskimo artist, Nŭpŏk. The latter are little ethnographic gems. This publication is not a preliminary report in the ordinary sense. It seems to be a final report on excavations at Kukulik for the years 1931–1935, but is not a complete monograph on the site, since the large mound is not entirely excavated. The volume offers a remarkable range of information: geographical and geological, biological, ethnographical, and archaeological. The ethnographical section, though brief, is valuable because it brings up to date the picture of native life on the island, which hitherto we have known best from E. W. Nelson's great monograph, *The Eskimo about Bering Strait*, based on observations between 1877 and 1881. However, the book suffers from a certain lack of organization, and some of the appendices do not seem to have any bearing on the main subject, which is, of course, the archaeology.

The excavations were made under the direction of Otto William Geist, and he has contributed the first three chapters, dealing with St. Lawrence Island today, the history of the excavations, and the description of the site. The section describing the modern and proto-historic houses and meat caches is especially good, and is illustrated with excellent diagrams. The main body of the book, dealing with the artifacts obtained, is written by Froelich G. Rainey, who himself did not participate in any of the excavations. His descriptions are meticulously detailed and are supplemented by excellent plates and text figures. The bulk of the material described comes from modern and recent-prehistoric (proto-historic) houses and meat caches, and gives us a valuable picture of the development of the culture from the end of the Punuk period up to 1879–1880, when the population of Kukulik was wiped out by famine. This study is particularly welcome, since this phase has been only briefly touched upon in Henry B. Collins' *Archaeology of the St. Lawrence Island.*

All of this more recent material from Kukulik came from above the nine-foot level in a large trench dug across the mound, and the specimens were catalogued with reference to the particular structures (house, shed, meat cache) with which they were associated. With the exception of the harpoon heads, some decorated objects, and a few specimens associated with them, the bulk of the material found below the nine-foot level was not accurately recorded, since it was difficult to correlate it with the crushed and disturbed houses (p. 171 f.). Apparently no systematic excavation by small squares and levels was at-

tempted, which would have overcome this difficulty to a large extent. The rather prominent layers of sod, representing periods of abandonment of the site, were not noticed until the end of the 1932 season, and even these, which could have given a very fine stratigraphic check, were never fully utilized (pp. 45, 200). The number of specimens taken from this site during the five years (1931–1935) is approximately 50,000, but an appreciable proportion of them can be of little scientific value, since adequate data about their provenience seems to be lacking.

In working out the sequence of the earlier cultures on St. Lawrence Island, Rainey has, therefore, been seriously handicapped. The modern and recent-prehistoric (proto-historic) stages are adequately represented and described, and the sections dealing with this part of the material are therefore the most valuable. The earlier periods, however, have been postulated solely on the basis of the harpoon heads, some decorated objects, and a few associated artifacts. Collins' *Archaeology of St. Lawrence Island*, which went to press about the same time that the present report was released, deals voluminously with the total cultural content of these earlier periods. The material from Kukulik, as far as it has been studied, fits in very well with Collins' conclusions based on his excavations near Gambell, and, as would be expected, adds a few types not found by Collins. But Collins' book is the definitive work on the earlier periods, and Rainey's studies can only support and supplement it.

For the benefit of the reader, I give below a table showing the equivalence of Rainey's and Collins' systems of classification of harpoon heads. Unless otherwise stated, these are classed by Collins as open socket or derived types (this table was submitted to Collins and embodies his corrections).

Rainey	*Collins*
A	Modern
B	Protohistoric III (b) x
C	Punuk III (a) x
D	Early Punuk III (a) x
E	Early Punuk (and Punuk?) closed socket V y
F	Early Punuk III (a) y
G	Punuk II (c) x
H	OBS-Early Punuk II y
I	OBS-Early Punuk III y
J	OBS I y
K	OBS closed socket V y
1	Modern
2	Late Punuk III (b) x
3	(Late Punuk-Protohistoric) Introduced Canadian Thule Type 3
4	(Modern V) (not rep. by Collins)
5	Late Punuk V
6	(Protohistoric V) (not rep. by Collins)

7	Late Punuk V
8	Punuk IV
9	(Like Punuk II (b) x, but also with end-blade x.) (Not rep. by Collins.)
10	(Early Punuk III (a) y
11	Punuk closed socket V (b) x
12	(Thule 1, Dorset 1, Kachemak Bay I) (Not rep. by Collins.)
13	Early Punuk and Punuk closed socket V x
14	OBS-Early Punuk III x
15	OBS closed socket II x (?)
16	Unfinished OBS III y
Pl. 36-1	Late Punuk V (?)
Pl. 41-3	[Like Punuk IV (a) x, but without blade (not rep. by Collins).]

An examination of the harpoon heads and associated objects permits a translation of Rainey's periods into the system established by Collins. Thus, Rainey's "Thule" is Collins' "Late Punuk;" Rainey's "Punuk" and "Birnirk" (he believes the "Birnirk" to be older than the "Punuk," though the stratigraphic information is not clear, pp. 217, 228) are both equivalent to Collins' "Early Punuk" through the fully developed "Punuk;" Rainey's "Old Bering Sea" is Collins' "Old Bering Sea (styles 2 and 3)." Because Collins' material permitted a definitive discussion of the early cultures, his terminology and cultural sequence should be adopted, and the following remarks are based, therefore, on his conclusions with which the reviewer heartily concurs.

Two points in Rainey's discussion need correction. First, there was no true "Birnirk" *culture* on St. Lawrence Island, though Birnirk-like harpoon heads are associated there with Punuk harpoon heads and Punuk culture. The Birnirk culture is an Arctic derivative of the Old Bering Sea culture, with its type sites near Point Barrow. In point of age it overlaps both the late Old Bering Sea and the Early Punuk. Some confusion has resulted from the application of the name "Thule" to the Birnirk culture (J. Alden Mason, *Excavations of Eskimo Thule Sites at Point Barrow*, Twenty-Third Int. Cong. Americanist, New York, 1930; Therkel Mathiassen, *Archaeological Collections from the Western Eskimos*, Fifth Thule Expedition, Copenhagen, 1930). The Birnirk culture is pre-Thule, being directly ancestral to the culture which was carried to Canada and which appears in the east as Mathiassen's Canadian Thule culture.

Secondly, there was no true "Thule" culture on St. Lawrence Island, if we mean by that the culture carried from Alaska to Canada. So far, only one Alaskan site comparable to Canadian Thule sites has been found: that is the mound site at Cape Prince of Wales, excavated by Jenness and Collins (Collins, *Culture Migrations and Contacts in the Bering Sea Region*, Am. Anthropologist, N.S., Vol. 39, 3, p. 377, 1937). The culture there is post-Birnirk, and is contemporaneous with the mature Punuk. Rainey's "Thule" stage is a complete

misnomer; the specimens (Plates 63 to 66) are excellent Late Punuk types. Other "Thule" types found on St. Lawrence Island are either those shared in common by the Punuk and the Canadian Thule cultures, or, like Rainey's Type 3 harpoon head, are actually Canadian types brought into Alaska from Canada at the beginning of the proto-historic period on St. Lawrence Island.

Only one harpoon head, Rainey's Type 12, found at the same level with an Old Bering Sea-Early Punuk head, needs a different explanation. This specimen resembles both Thule Type 1 and Dorset Type 1 heads, but in particular the heads from Kachemak Bay I. Its great age in southwestern Alaska and on St. Lawrence Island shows that it antedates the late return of the Thule culture from Canada. It was on the basis of the distribution of such simple harpoon heads in eastern Canada and southwestern Alaska that I suggested for northern Alaska a Thule like or proto-Thule stage, probably contemporaneous with the Old Bering Sea. Let me admit now that I was far more guilty of rash guessing than Rainey has been, for my hypothetical culture stage was postulated on the basis of harpoon heads which had not at that time been found in northern Alaska. Perhaps future excavations in the north will show that there was some simple Eskimo culture, influencing the development of the Birnirk-Thule series, and from which Rainey's Type 12 head may have been a stray, but at present this can be only a subject for speculation. We should note that this specimen is rather similar to heads of Late Punuk V (Rainey's types 5 and 7), which is a variable type, and it may therefore be a much younger specimen than its apparent position in the midden would indicate.

FREDERICA DE LAGUNA
University of Pennsylvania Museum
Philadelphia

The Occurrence of Flints and Extinct Animals in Pluvial Deposits Near Clovis, New Mexico, Part IV: Report on Excavation at the Gravel Pit, 1936. JOHN LAMBERT COTTER. (Proceedings of the Academy of Natural Sciences, Vol. 89: 1–16, Philadelphia, 1937.)

The Archeological and Faunal Material from Williams Cave, Guadeloupe Mountains, Texas. MARY YOUNGMAN AYER. (The same, Vol. 88: 599–619, 1936.)

The report by Mr. Cotter upon the field work of the Academy of Natural Science for 1936 is a welcome addition to the literature bearing upon the subject of the association of man with extinct mammals in North America. Moreover, it possesses the added merit of complete objectivity—being a careful account of work performed and results attained—without any signs of the special pleading either for or against antiquity which have in the past too often marred reports upon this subject.

The finds described are unique in several important particulars. In the first place, this site at Clovis, New Mexico, has yielded the first, and so far the only evidence as to the method of hafting employed by the Folsom people upon

their weapons. In immediate association with the bones of a mammoth, a cylindrical shaft of bone was recovered which bore traces of beveling at both extremities. Later, an additional shaft of this type was recovered with a well-defined bevel at only one end. The nature of the artifacts is such that Mr. Cotter is led to point out the remarkable resemblance which may exist between the technique implied by these specimens and the methods of splicing shafts and foreshafts as known among the living Eskimo. While an actual toggle cannot be established on this evidence, it is by no means an impossibility, and, as the author says, "it may at least be implied that shafts employed by the makers of Folsom-like points at Clovis were made of more than one piece."

The points recovered in association with the mammoth bones were Folsom-like, but artifacts on the surface of dumps surrounding the gravel pit included a Yuma and a "true" Folsom, as well as a small point suggestive of one or two of those reported from the Lindenmeier site by Roberts. Hence, attempts to observe typological sequences were wisely held in abeyance. It is to be hoped that the 1937 work in this area has thrown greater light on this problem.

As for the faunal associations, that of the mammoth is most striking inasmuch as it aids in substantiating the authenticity of certain earlier finds and lends added weight to the site at Dent, Colorado, reported by Figgins. The reality of these occurrences may now be regarded as fully demonstrated. As to whether the comparative infrequency of cases of mammoth association, as contrasted with those of bison, is to be attributed to an earlier disappearance of the proboscideans, or whether the bison merely represented easier hunting, and hence were more sought, we do not know. The case for a very late survival of the mammoth (*E. columbi*) is not so well substantiated as in the case of the mastodon, and that of the latter is weak enough. Scott, in his recently revised work, *History of Land Mammals in the Western Hemisphere*, Macmillan, N. Y. 1937, p. 261, makes a good deal out of the reported case of association of painted pottery with mastodon remains near Quito, Ecuador. This find has never been described in sufficient detail to convince the present writer, particularly since discussing the find with one who has visited the site and who retains doubts as to the actual contemporaneity of the association. Again, it must be remembered that in all the archaeological work carried out in North America over many years, no such mammoth or mastodon associations have ever been substantiated from Basket Maker or other remains; this in spite of Scott's broad statement that "many Pleistocene animals were in existence only a few centuries ago." A few millennia would encourage no rebuke as a conservative opinion, but as it stands, it is an assertion without serious foundation in proof. The writer is quite willing to consider, in the tentative state of our present knowledge, a *relative* recency of extinction for the last of the great proboscideans, but as one with field experience in both paleontology and archaeology, I find it difficult to follow those enthusiasts who can dispose of animals whose bony remains are as rugged as those of the *Elephantidae* in times commensurate with early ceramic horizons in North America. The future contains the answer

to these problems, however, and it is to the efforts of such careful field workers as Mr. Cotter that we will owe the solution when it finally is attained.

The study by Mrs. Ayer concerns the archaeological work of the Academy during the summers of 1934 and 1935 at Williams Cave in Culberson County, Texas. It does not concern the problem of man's antiquity directly, since human remains earlier than the Basket Maker were not recovered here. An extinct fauna was secured from the cave, however, and this is of some interest in regard to the latter problem.

The main criticism which can be levelled against this work is one of brevity. Mrs. Ayer fails to record, for example, the presence of a rabbit stick, with the typical grooves, associated with Burial 2 (p. 601), and which had apparently been "killed" and sent along with the child—an interesting indication of the animistic beliefs of this early people. Plates would have helped in the elucidation of the Basket Maker material, which is actually unusually full and interesting. In fact the whole Basket Maker complex in this particular area deserves more extensive treatment than it has yet received.

In addition, there is a failure to make as plain as might be desired the various levels in the cave in so far as these pertain to the extinct species of animals recovered. It may be assumed that these came for the most part from below the sloth level of compacted dung, which extended almost across the cave at one depth. Yet, in regard to *Felis oregonensis*, the remark is made that the specimens were separated from each other by several feet, and two in depth, but the relation to the sloth layer is not indicated. Actual diagrams of the cave, of the sloth layer, and the various depths of the bones recovered, would have lent more weight to the statistical reports which conclude the paper. Indications of the fact that the extinct material lay below and not in association with the Basket Maker material, while implied, is not always very clearly set forth from the standpoint of the layman.

Nevertheless, these are minor faults compared with the preservation of the valuable material recorded. It is only to be regretted that funds were not available for a full photographic record of the archaeological material. It is a tragic circumstance, lending extra importance and value to this paper, that numerous caves throughout this area have been robbed of their content, and therefore their scientific value, by the digging of careless amateurs. Some of the most excellently preserved and perishable material in all North America has disappeared from these caves without ever being scientifically examined or recorded. Mrs. Ayer deserves thanks for placing on record, even in a somewhat abbreviated form, a description of the Williams Cave material. This reviewer, for one, looks forward to additional efforts in this area.

LOREN C. EISELEY
The University of Kansas
Lawrence, Kansas

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